FLIGHT
and
The AIRCRAFT ENGINEER

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The Outlook

Cheap Speed

"AIRCRAFT will never be a cheap way of getting a thing or a person from A to B . . . but it offers a far from prohibitive form of very rapid transport." These two sentences sum up the basic views of Major R. H. Thornton, whose lecture to the Institute of Transport is published in this issue. Even the most enthusiastic protagonist of flying must, if he takes the trouble to study the facts, agree with the former, while the "gloomy" (among whom Major Thornton counts the airline operators themselves) may take comfort from the fact that he does not consider the cost of speed prohibitive. Between the two there lies a useful range of commercial applications.

Major Thornton's lecture is characterised by a very frank facing of facts, as one would expect from a man of his experience. We particularly like his comparison of pay-loads per unit of energy in the case of the 12 m.p.h. ship and the 200 m.p.h. aircraft, and the 1,800 pound-miles per hour of work of aircraft compared with the ship's 92,512. These figures are illuminating and, as the lecturer said, "a vehicle which burns 89 times more of it (petroleum fuel) than another to do the same job is hardly a welcome visitor."

By these few figures the fallacy of cheap air transport seems to be fairly effectively exposed, but there is no need to become depressed on that account. The figures merely show why air transport cannot be cheap if speed is of no value. Major Thornton proceeds to show that there is plenty of traffic which *will* pay for speed.

In the reference to the time spent by commercial aircraft on the ground (five hours out of every six) one may trace the outlook of the shipowner. Major Thornton expects substantial improvement in that direction. Doubtless he is right, although an aircraft will always be a far more delicate mechanism than a ship, and therefore require more attention. Frank Searle tried to introduce the intense working of aircraft in the early days of Imperial Airways. He failed largely because aircraft of those days were not suited to intense work without what Major Thornton calls "tinkering," and they differed greatly from the L.G.O.C. buses to which Mr. Searle had been accustomed.

On the political side the lecturer had many interesting things to say. He is obviously not optimistic enough to expect complete "freedom of the air," but he does want free passage for peaceful and innocent air traffic. The suggestion that airports on the great trunk routes should be internationally controlled and virtually extra-territorial in status, as once was the port of Hamburg, is one which merits very careful consideration.

Aircraft for the Navy

SHORTLY after he became Prime Minister, Mr. Winston Churchill expressed the view that there was little profit in attempting to assign the blame for our shortcomings to previous Governments and individuals. In other words, he was not going to indulge in idle recriminations. It was rather a pity that members of the House of Lords did not bear in mind the Prime Minister's injunction the other day when they discussed the subject of aircraft for the Navy. The old inter-Service controversy was resuscitated and a lot of time was spent on going over old ground, time that might have been more profitably devoted to examining ways and means of ensuring that we shall do better in future.

The Motion moved by Lord Chatfield was, in itself, sound enough. It asked what is the administrative chain which ensures that aircraft of the Fleet Air Arm

and of Coastal Command are designed to meet the requirements of their users. Lord Templemore answered that question, and we reproduce his reply elsewhere in this issue. But most of the debate wandered right away from the Motion and can merely have served to open old wounds. If their lordships were indeed voicing the feeling of the Navy and the Royal Air Force, the debate might have been justified. But they were not. The Services do not desire a revival of the old controversy, and they will be grateful to Lord Templemore for his plea: "I do suggest with all respect to the gallant Admirals of the Fleet and to my noble friend, Lord Trenchard, that they call it a day and let these great Services get on with their jobs."

The Out-moded Dive-bomber

IN Parliament and elsewhere questions are still occasionally asked in a hopeful or despairing tone about when we may expect to receive the dive-bombers which we ordered from America in June, 1940. Some few, it is believed, have already arrived, and when the rest come to hand they will be accepted by the R.A.F. with modified gratitude. Probably they will be used almost exclusively against enemy shipping, which seems to be the one form of attack for which the dive-bomber is admittedly useful. It is still capable of upsetting the nerves of raw troops, but low-flying fighter-bombers can do that with equal effect, and the said troops usually say, after such an attack, that they have been dive-bombed. The fighter-bomber is a British invention, which the Germans have now copied. It does more damage at less cost in aircraft shot down.

There have been two dive-bomber types in this war, the Ju 87 or Stuka, and the Blackburn Skua of the Fleet Air Arm. The latter was also a fighter, but not well suited for the role. As a dive-bomber it did one useful piece of work by sinking a German cruiser early in the war, but it is now completely obsolete. The Ju 88 did not make a good dive-bomber. It is the Stuka Ju 87 which will go down to history as *the* dive-bomber.

On land the Stuka worked most effectively with the German Panzers or ground troops in the campaigns of Poland, Norway, France, Greece and Crete, in none of which it met adequate fighter opposition. At the end of the Greek campaign. Gen. Sir Thomas Blamey spoke emphatically of the little damage which it had done. Its moral effect was great, but its destructive power small. Whenever it has been met by fighters it has invariably suffered heavily—unless its escort could protect it. Ground gunners with steady nerves can also take severe toll of the clumsy divers. The most creditable performances of the Stukas have been the damaging of the two carriers, H.M.S. *Illustrious* and *Formidable* in the Mediterranean. But for those misfortunes to the Royal Navy, Admiral Sir Tom Philips might not have been left without air support off Malaya.

The possession of dive-bombers would certainly help the R.A.F. and the F.A.A. in the Mediterranean, where one of the most important tasks is to cut the sea link betweeen Sicily and Tunisia. The most effective weapon now at the disposal of our aircraft is the torpedo, but that weapon has its drawbacks. On the whole, it cannot be called an accurate weapon, though when it scores a hit the effect is most satisfactory. The dive-bomber can ensure great accuracy, and probably it calls for less skill and no more risk to the pilot than dropping a torpedo.

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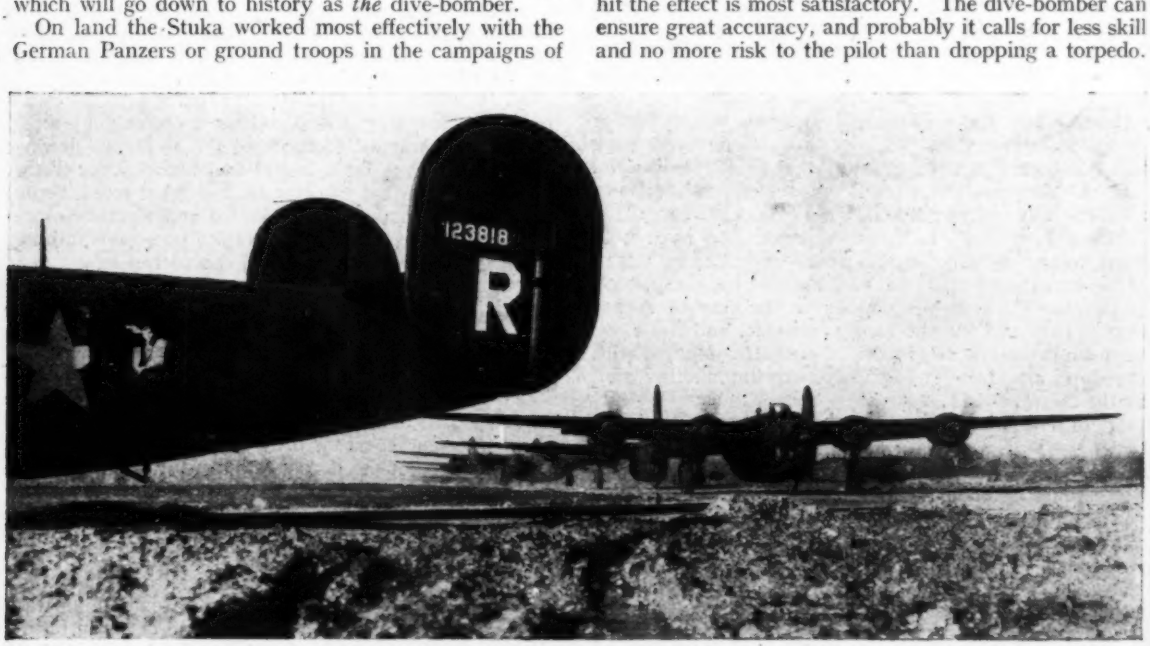


ROUND THE PERIMETER TRACK: Liberator IIIs of the U.S. Army Air Force in Britain taxying to the take-off point for daylight operations.

WAR in the AIR

FOR ITALIAN INTRUSIONS : A de Havilland Mosquito flying over Malta where a squadron of these fast light bombers are stationed for intruder operations.

Aircraft in Tunisia Battles : Fortresses Score Off Rabaul : Japanese Futile Raid on Assam Airfields

THE fighting in Tunisia has been very mechanised, noticeably so even in this age of mechanical warfare. Tanks and aircraft have played a great part in it, though nowadays it is recognised that infantry are also of prime importance and must work with the tanks. Rommel picked up some Tiger tanks after his arrival in that country. These weigh between 55 and 60 tons, and carry an 88 mm. gun as well as two machine guns of 7.92 mm. calibre, say 0.315 inches. On the other hand the British have been using Churchill tanks for the first time, so far as is known, which weigh about 40 tons. The Axis is estimated to have some 220 tanks in the region of the Kasserine gap. There have been heavy clashes between the opposing tanks, while fighters and bombers of the U.S. Army Twelfth Air Force have been very active in setting about the attacking German forces. It is not to be expected that bombs will lay out many tanks, unless the latter's tracks are broken, but much damage was done to other targets.

The Allies have a strong preponderance of air power in Tunisia, but are short of airfields. Three of them were lost in the first onrush of Rommel's men. In consequence the Axis was able to concentrate in the central area where the thrust was made, and that area was out of the reach of the short-range fighters with the First Army in the North as well as of those with the Eighth Army in the South. That is not to say that no British or American short-range fighters were able to take part in the battle, but the Allies were not able to use their superior air strength there. Later accounts have also made it clear that the Axis air attacks on the Americans at the beginning of the engagement were not made entirely with Stuka dive-bombers, as was at first reported, but by a mixture of Stukas and fighter-bombers in about equal numbers. Inexperienced troops would naturally be unable to understand the distinction between them as they saw both types coming downwards at them and dropping bombs; but the bomb of the Stuka is much heavier than that of the fighter-bomber. The Germans seem to have lost faith in the Stuka of late, and the number possessed by the *Luftwaffe* is said to have been reduced from 500 to 300, while some Stuka squadrons have gone out of existence altogether.

Fortunately British and American reinforcements of tanks and infantry

OVER THE TARGET : A Ventura flying below another Ventura during a daylight raid on the steel works (bottom left corner) at Ijmuiden in Holland.

WAR IN THE AIR

were able to repulse Rommel's thrust. As his columns withdrew through the Kasserine Pass, they were vigorously pursued by Allied bombers and by such fighters as were available.

Allied aircraft have been busy off the coasts, attacking the Axis convoys. They do not sink so many enemy transport ships as the submarines of the Royal Navy do, but they add a very useful quota to the total of sinkings.

Malta, in particular, has become a positive thorn in the side of the Axis supply services, and a very satisfactory piece of work was done last week when a large tanker, estimated to be carrying three million gallons of petrol, was attacked and crippled in the Sicilian narrows. She lay off Lavenzo for two or three days, and then Malta's torpedo-bombers found her one moonlight night and put three torpedoes into her amidships. She promptly went up in flames. The amount of Axis supplies must be calculated with an allowance for a certain percentage of loss, but to lose 3,000,000 gallons of petrol at one fell swoop must have been a grievous disappointment. In addition, Middle East aircraft have been intruding by night over Sicily and Italy, and have attacked targets round Taranto, Naples and other places.

It has been announced that Air Vice-Marshal Broadhurst is to command the Allied air forces in the Western Desert, now that Air Vice-Marshal Coningham has gone into General Eisenhower's command. The term "Western Desert" has been almost forgotten since the battle of Alamein, but now it has been revived. It seems to mark the fact that Libya is no longer the scene of first-class operations. Air Chief Marshal Sir William Welsh, who went to French Africa in command of the R.A.F. working with the First Army, has given up his command now that all the forces there have been reorganised.

THE C.A.S. VISITS: Air Chief Marshal Sir Charles Portal, G.C.B., D.S.O., M.C., Chief of the Air Staff, talking to air crews and ground staff during a visit to an air station in Malta. Facing the camera is Sir Keith Park, A.O.C. Malta.

The Fighting in Burma

ALTHOUGH the main centres of interest are in Russia and North Africa, one ought not to forget the fighting which is going on in Burma. It seems that we shall have to wait until forces can be spared from the West before we can set about the Japanese there in earnest. It is very bad luck on the Chinese that we cannot open the Burma Road just yet, and it is probably very galling to Field Marshal Sir A. Wavell to have to wait and mark time while the cold-weather season passes. In the meantime he is training his troops in jungle warfare.

Last week a spirited raid of the Commando sort was carried out on the village of Myebon, about 60 miles to the south-east of Akyab. The Royal Indian Navy was responsible for getting the troops ashore, but there has been no mention of British or American aircraft taking part. As our troops suffered no casualties, there was evidently no reason for using more force than we actually did use; though it is very unusual in these days for any operation to be carried out without the air having some part to play in it.

The constant bombing of Japanese communications in Burma is evidently causing considerable worry to the enemy. So the other day they tried to diminish the causes of their trouble by bombing American airfields in Assam. They sent in a useful little force of 30 bombers and fighters, but they did not succeed in effecting a surprise. They were intercepted by U.S. fighters, which shot down six for certain, probably destroyed 12, and damaged others, without loss to themselves. The fight was as satisfactory as it could have been, and it is also very gratifying to see that Allied bombing is driving the enemy into this sort of action.

Farther to the eastward, General MacArthur's heavy bombers have been continuing their very profitable offensive against the Japanese. Not a few transports have been sunk or damaged, and the other day Fortresses attacked a large enemy warship some twelve miles off Rabaul. The ship took such violent evasive action that she ran on to a reef. No doubt she will not reach the haven where she would be without some further attention from American aircraft. There is every reason to suppose that shipping, both naval and mercantile, is the Achilles' heel of Japan. Her losses since she attacked the United States at Pearl Harbour have been heavy in all classes, and though her shipyards are doubtless working at the highest pressure, it is doubtful whether they can have made good all the losses. In any case, they cannot keep pace with the production of Britain and America.

RUMANIAN RUMINATIONS: General Pantazi, the Minister of War in Rumania, arrived by Ju 52 on a tour of inspection of the Russian Front.

WAR IN THE AIR

ENEMY AIR LOSSES TO FEB. 27th.

	Over G.B.	Over Continent	Middle East
Feb. 21	0	0	2
,, 22	0	0	5
,, 23	0	0	2
,, 24	0	0	0
,, 25	0	0	0
,, 26	5	1	2
,, 27	0	2	0
	5	3	11

Totals : West, 6,650 ; Middle East, over 5,239.
North Africa : Nov. 10, 1942, to Feb. 26, 1943 : 689.

Later News

FOR a time the battle in Tunisia looked rather nasty, when the Axis were through the Kasserine Pass, and there seemed to be a threat to the flank of the First Army. But evidently General Alexander dealt very efficiently with the situation, and Rommel's men had to retreat quite as fast as they came on. Evidently Allied reinforcements had been brought up, and aircraft were got together so as to pursue the retreating enemy and inflict all possible damage on him.

Then the Axis turned its attention to the northern sector, and made a series of attacks there, probing at several points simultaneously. These were repulsed with loss to the enemy. There, too, the R.A.F. distinguished itself, and Hurricane bombers were very active in upsetting or setting on fire the enemy's vehicles. A fairly large petrol dump in a farmhouse was exploded.

Meanwhile General Montgomery was massing his Eighth Army opposite the Mareth line, and sending out fighting patrols to find its weak spots. His aircraft were also active, fighters and fighter-bombers attacking troop concentrations and transport, while medium bombers took on other targets, and enemy airfields were raided at night.

INTERESTED SPECTATORS : North African natives watching a Spitfire V being serviced by steel helmeted ground staff.

The Western Front

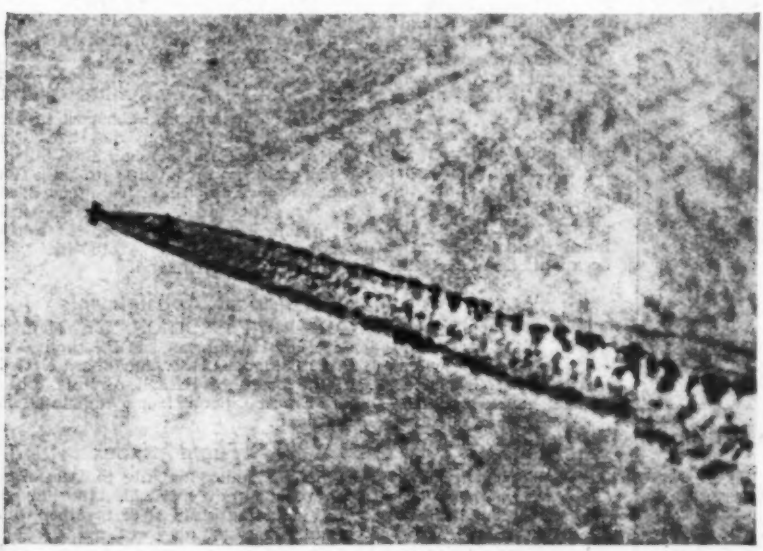
THE R.A.F. in Great Britain and the U.S. 8th Air Force have combined in a terrific bombing effort in the last few days, accomplishing something like "round the clock" raiding for a period of 72 hours. Between a raid on Nuremberg on the night of Thursday, February 25th, and Saturday morning, February 27th, the four Home Commands of the R.A.F. sent out more than 2,000 sorties, and the aircraft between them flew a million and a half miles. Nothing of the sort has ever been attempted before. The attacks were switched from target to target, so that the enemy never knew where to expect the next one. That naturally put a great strain on all his defences, and particularly on his fighter force. That force is being stretched more and more, and is obviously unable to fulfil all, the duties which are expected of it. We must remember that if a fighter force fails completely, its side loses command of the air, and that may lead to the very greatest results.

The German reply is "sneak raids" on coast towns by fighter-bombers, which are only "frightfulness." They will not win the war.

BRITISH & U.S. AIR LOSSES TO FEB. 27th

	Over G.B. A'crft.	Over Continent D'bns.	Over Continent F'trs.	Middle East A'crft
Feb. 21	0	0	0	4
,, 22	0	0	0	0
,, 23	0	0	0	2
,, 24	0	0	0	1
,, 25	0	9	0	0
,, 26	0	13	2	0
,, 27	0	1	4	0
	0	23	6	7

Totals : West, 5,283 ; Middle East, about 2,084.
North Africa : Nov. 10, 1942, to Feb. 26, 1943 : 299.



CAUGHT IN THE ACT : A Royal Air Force photograph of a German D.F.S.230 glider being towed off by a Ju 87 from a desert airfield.

A. T. A. BENEVOLENT FUND

WE are happy to publish a further list of donations to this deserving fund :—

	£	s.	d.
Amount previously acknowledged	5,497	4	9
Cunliffe - Owen Aircraft, Ltd., Swaythling, Southampton	175	0	0
The De Havilland (Northern Sports Club), Lostock	70	6	1
The Herts and Essex Aviation, Ltd.	10	10	0
M. Croisdale, Esq., 163, Ring Road, Farnley, Leeds	1	0	0
Ernest Burrows, Esq., Watergate, Dewsbury	1	0	0
The Scottish Flying Club, Ltd.	10	10	0
Personnel of A.T.A. and B.O.A.C. to January 31, 1943	1,551	18	10
	£7,317	9	8

HERE AND THERE

Tribute to the Hurricane

SIR STAFFORD CRIPPS, Minister of Aircraft Production, in a speech to aircraft workers recently, said: "Some of you may question whether the Hurricane has finished its useful life. It has not. The Hurricane to-day is just as essential a factor to our victory as at any other time in its history."

"The R.A.F. in Art"

A COLLECTION of oil paintings and water colours will be exhibited under the title "The R.A.F. in Art" at the Rootes showrooms, Devonshire House, Piccadilly, London, W.1, until March 13th.

The exhibition, which was opened on Tuesday by Capt. H. H. Balfour, is in connection with the "Wings for Victory" week, and admission is free.

The Lawrence Sperry Award

EDWARD C. WELLS, assistant chief engineer of the Boeing Aircraft Co., at Seattle, has been awarded the Lawrence Sperry Award for 1942, "for outstanding contributions to the art of aircraft design with special reference to four-engined aircraft."

Mr. Wells, who joined Boeings in 1930, was responsible for the basic design of the Flying Fortress prototype eight years ago, and has contributed to most of the improvements since made in the B-17 series.

Coming Events . . . .

INDICATIONS that the United States are contemplating a coming offensive has led Col. Nakao Yahagi, chief of the Japanese Army Press Section, to warn the Japanese public to expect air raids. He thinks America will shuttle planes between China and Alaska in order to effect the raids.

Signs that the U.S. are planning such an attack are, according to Col. Yahagi, the building in China of 17 new airfields, the installation of radio-telephone between Alaska and China and the almost daily bombing of the Japs in the Aleutians.

New Canadian Anson

A NEW Anson trainer, with a fuselage of moulded plywood veneer and powered by a pair of Pratt and Whitney engines, has just received its first flight tests in the hands of the R.C.A.F. at Ottawa.

Of Canadian design, it is equipped specially for the training of navigators, wireless operators and bomb-aimers, and embodies some thirty modifications suggested by the training experience of the R.C.A.F. in operating the British Commonwealth Air Training Plan, now the Combined Training Organisation.

X-ray Conference

THE Institute of Physics is arranging a conference in Cambridge on April 9th and 10th, on the subject of "X-ray Analysis."

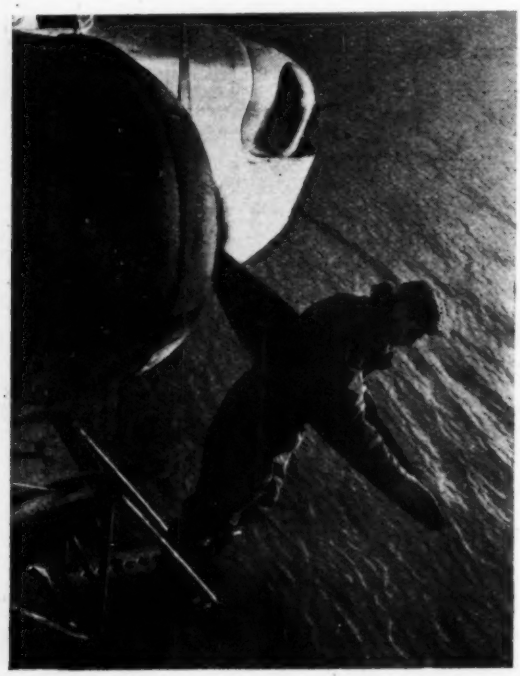
One of the chief items will be a lecture on "Future Developments in X-ray Crystallography," by Professor J. D. Bernal, and there will be discussion on various other aspects of the subject.

Flight of Empty Plane

IT is reported that a Liberator bomber without a pilot flew for twelve hours over the Atlantic and Gulf of Mexico before crashing into a mountain in Mexico.

After taking off from Florida and flying out to sea, the tail began to flutter and the aircraft lost height. The crew of six and two passengers baled out, having previously jettisoned the cargo.

Apparently the automatic pilot had been set for a level flight across the Atlantic, but the course changed and the aircraft crashed 2,000 miles from where the occupants had baled out.



VERTIGO! How many of us could emulate this Sunderland flight-engineer who, from the retractable maintenance platform examines a slightly damaged propeller-tip? Leaning out from such a small perch some 20ft. above the water would produce dizziness in most earth-bound mortals. Let's hope the compression is okay!

Plastic Problems

THE chairman of the British Plastics Federation, Maj. S. M. Mohr, has stressed the need for publicity to explain the various types of plastics and their uses.

The public generally, he said, had only a hazy idea of the meaning of plastics, and it should be pointed out that there were many obstacles to overcome and problems to solve before plastics became of universal value. They were not yet the "gold mine" some people seemed to imagine.

Production in America

MR. DONALD NELSON, chairman of the U.S. War Production Board, has announced that in December last 5,489 aircraft were delivered to the Army, Navy and the Allies, and that the output of engines is ahead of aircraft production.

The output of aircraft for that month represents an increase of 20 per cent. above the November figure.

It's a Date!

THAT he believes the Axis air forces are now on the decline is the view expressed recently by Lt. Gen. H. H. Arnold, chief of the U.S. Army Air Force.

He said to some U.S. officers, while in a jocular mood, "I have an appointment in Berlin a year from to-day, and will meet you six months afterwards in Tokyo."

British Air Offensive

SINCE the outbreak of war, more than 100,000 tons of bombs have been dropped by R.A.F. Bomber Command on targets in Germany, Italy and occupied countries it has recently been announced. The great increase in our bomber offensive in 1942 is revealed by the fact that more than half this total had been dropped during last year.

Army Co-operation and Fighter Command aircraft have, in addition, dropped a large weight of bombs.

Secret Post for Sir William Welsh

HAVING relinquished the post of Air Officer Commanding the R.A.F. in North Africa, Air Marshal Sir William Welsh returns to London to take up another position, the nature of which is not yet disclosed. Air Chief Marshal Sir Arthur Tedder will absorb the North African Air Command into the new Mediterranean Command.

Parnell Appointments

SIR ERNEST SIMON, Mr. Maurice Hely-Hutchinson, M.P., and Mr. P. C. Crump, O.B.E., have been elected to the board of Parnell Aircraft, Ltd., Sir Ernest Simon being appointed its chairman.

"Flight" Index

FLIGHT index for July to December, 1942, is now available; the price is 7½d. including postage, or together with binding case, 4s. 4d.

Readers' copies can be bound at a cost of 13s. 3d., including postage, on the return of the completed volume.

Specialised Training

The Rotol and Dowty Schools of the R.A.F. Technical Command

SINCE the Hele-Shaw variable-pitch airscrew made its appearance in 1928, airscrew design and development have advanced so rapidly that the modern airscrew, whether of the hydraulic or electrical type, has become a component which calls for high mechanical skill and a specialised knowledge for all engaged in maintenance. Apart from the mechanism involved, the blades themselves, whether of metal or improved wood construction, call for different requirements regarding maintenance in service.

With the foregoing points in mind, it was realised that a school in which members of the R.A.F. and Fleet Air Arm could receive instruction on the maintenance and repair of the various designs was required. In addition, it was necessary that they should become conversant with the various improvements as and when introduced if the utmost efficiency and co-ordination between the manufacturers and the actual users of their products was to be obtained.

The school started in a very small way, actually in the corner of one of the factory buildings, in October, 1939. In a short space of time its worth was recognised as being of such great importance that the need for enlarged premises and greater facilities became imperative. After various temporary changes, the school was finally located in its present position in existing buildings, where to-day there is a standing complement of over 100 students from the various Services continually in attendance. The school, under the Technical Training Command of the R.A.F., has more recently opened its doors to members of the W.A.A.F. and also the American Army Air Force.

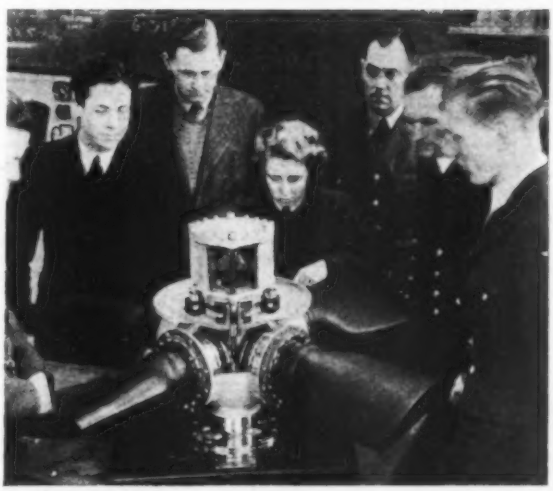
Civilian Instructors

The staff consists of civilian instructors who have been associated with the development of Rotol airscrews since their inception under the Chief Instructor, Mr. R. Rickman, late of Rolls-Royce, Ltd. By permission of the Air Ministry, *Flight* has recently visited this school, at which is evident an obvious desire on the part of the manufacturers to pass on to the Services the knowledge that will ensure maximum efficiency from their airscrews. Instruction is greatly assisted by the excellent equipment available, which includes airscrews of all models, with the hub sectioned to show the principles of operation, and an abundance of very clear diagrams around the classrooms.

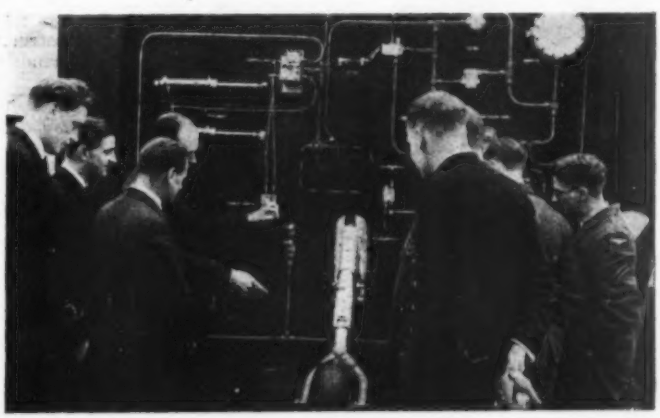
The work in the school comprises three separate courses, each of which may be taken individually or consecutively. Whilst attending these courses, Service personnel are found lodgings in private houses, thus giving them a change from Service life, with opportunities for amusement in their hours off duty. It is gratifying to hear from Mr. Rickman that these privileges are greatly appreciated and never abused, the students being, almost without exception, extremely keen and interested in the courses.

Past students have included Americans, Australians, Canadians, Czechs, Free French, Indians, Norwegians, Poles and New Zealanders. Though the language question has presented certain difficulties, it has been found in practice that what is not understood in the lectures is made up for by the practical instruction.

In April, 1941, a series of courses was inaugurated at the present school. These covered both main types of Rotol hydraulic airscrew: the external-cylinder type with three and four blades, and the internal-cylinder type.



The two main types of Rotol airscrew demonstrated. Instructors explaining the electrically-operated (top) and the hydraulic mechanisms by means of part-sectioned hubs and blade roots. The hydraulic is a 4-blader.



(Right) a class in the demonstration room at the Dowty school. On the panel are the equivalents of the controls on a bomber.

SPECIALISED TRAINING

In June of the same year it was found advisable to put on a separate course dealing with the American Curtiss electric airscrew. Very shortly after this course started, the Rotol electric airscrew went into production, so instruction on this type was included in the same course. It was realised, however, that one week was not sufficient fully to cover the subjects dealt with, so arrangements were made with Headquarters of Technical Training Command to extend these courses and also that upon the hydraulic types to a fortnight, which permitted of practical instruction to be included.

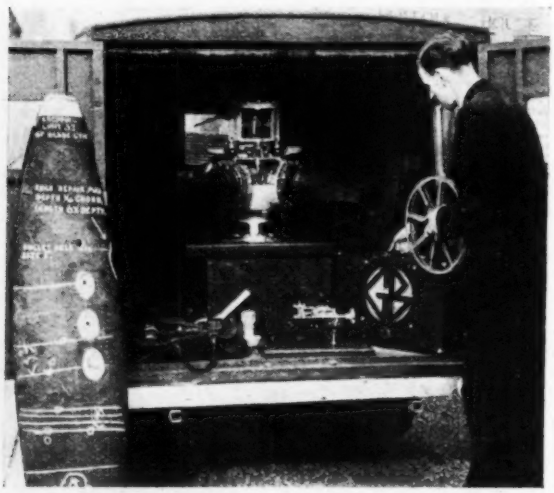
This practical instruction covers the complete dismantling and assembly of all the various types of airscrews dealt with in the appropriate course, coupled with practical instruction on installation.

After the first four days, during which lectures on the various types are given, students are issued with overalls and passed to the assembly rooms, where they are divided into small groups, working on each particular type in turn.

In the course on the electrical types, lectures having been completed, the electricians are separated from the fitters and, in turn, receive electrical instruction of a practical nature on Curtiss and Rotol electric airscrews.

Following requests from various R.A.F. Commands that practical instruction in field repairs to wood blades (extensively used on Rotol airscrews) should be given, 1½ days of each course are now set aside for such instruction on repairs and re-covering of actual blades of various types.

Repairing a wooden blade for a Rotol airscrew. Instructor showing how to shape the plug for a bullet hole.



(Above) the Rotol travelling demonstration van which visits squadrons. (Below) demonstrating the variation in pitch and boost with throttle control.

During the second week, pupils are given an oral examination, the whole class being assembled together and questioned in turn.

Following the oral examination, they visit the school cinema, where instructional talking films are shown on overhaul, inspection, and production of Rotol airscrews. Each class is conducted round the Rotol Factory during one afternoon of the second week of each course, whilst electricians, in addition, spend an afternoon in the Electrical Repairs Department.

Award of Certificates

On the last day of the course, personnel complete a written examination and are released from duty until the afternoon, when they reassemble for general revision, after correction of their examination papers, and are dismissed with a certificate to all who have acquired the requisite number of marks. The final assessment of marks, which is passed through to Headquarters of Technical Training Command, is compiled from results obtained from both the written and the oral examination, practical results on wood blade repairs, and general fitting ability.

It is fully realised that even with this steady flow of trainees attending the courses it would be impossible to keep pace with the expansion of the Services and introduction of new types. In consequence, the school was supplied with a small R.A.F. van, which has been fitted up with instructional equipment, cine-projectors, flight tool kits, etc., and an instructor is detailed to carry out instructional tours arranged through the various Commands. This travelling instructor works in close liaison with the Service Department of Rotol Airscrews, so that where possible the instructor's visit is timed to coincide with that of a representative from the Service Department.

Another of the many schools under the Technical Training Command, R.A.F., which provide manufacturers' courses is the Dowty School of Aircraft Hydraulics. Obviously, the widespread use of Dowty hydraulic equipment for aircraft rendered necessary provision for technical instruction in its operating principles and maintenance.

A large house with extensive

grounds, situated in delightful country surroundings, now forms the Headquarters. Up to 35 pupils can be billeted on the premises. In addition to the classrooms a large lounge is available, comfortably furnished, in which meals are served. Instructional films are shown in this lounge during the course, whilst on certain evenings pupils are provided with a cinema entertainment by the school management. The school has its laundry on the premises, and a large portion of the extensive grounds have been cultivated, providing sufficient vegetables for the pupils all the year round. A popular leisure-time attraction during the summer months is an open-air swimming pool situated in the grounds.

Mr. R. F. Hunt, late of Dowty Equipment, Ltd., is responsible for the instruction provided, and is ably assisted by a staff of civilian instructors. Major C. H. Wolf has recently been appointed as Duty Officer and is responsible for discipline and good conduct. In this case the normal course lasts for one week, and included in the syllabus are some twenty lectures on such subjects as theory of hydraulics; hydraulic systems; pumps; valves; general maintenance; and practical workshop demonstrations. Students are also given a visit to the Dowty factory.

The chief instructor explains the mechanism of the Dowty locking device on a Lancaster undercarriage leg.

From Horticulture to Hydraulics

In the demonstration room, which was once the conservatory, are the actual layouts of the Dowty equipment provided in the Hampden, Hurricane, Typhoon, and other aircraft. The actual leg of the Lancaster has been included to demonstrate the special locking devices. All these layouts can be put into operation by the instructor to demonstrate his points during the lecture. Even the skylights, which once opened with difficulty by hand, are now modernised and equipped with Dowty hydraulic jacks. In the workshop, pupils dismantle, reassemble and test hydraulic equipment under expert guidance. The instructors have been carefully selected for their expert knowledge and teaching ability, and the efficiency of the school is reflected in the consistently satisfactory examination results achieved by pupils at the conclusion of each course.

Members of the Services attending this course are highly appreciative of the instruction offered them and of the facilities available for their comfort. This is emphasised by the entries in glowing terms recorded in the visitors' book over a long period, one of which especially deserves mention. "A really 'live-line' course with constant 'high-delivery.' A pity to have to 'cut out' so soon."

Demonstrating the action of a Dowty retractable tailwheel.

"WINGS FOR VICTORY"

Exhibition in Aid of the Special Week

TWO exhibitions in support of the "Wings for Victory" week were opened in London on Tuesday and Wednesday under the auspices of the National Savings Committee, and both remain open until Saturday, March 13th.

As mentioned elsewhere in this issue, "The R.A.F. in Art" exhibition, held in the Piccadilly showrooms of Rootes, Ltd., Devonshire House, was opened on Tuesday morning by Capt. H. H. Balfour, Parliamentary Under-Secretary of State for Air; and the other, an aircraft exhibition, was opened yesterday at Dorland Hall, Lower Regent Street, by Lord Sherwood, Joint Under-Secretary of State for Air.

New War Pictures

A third exhibition, which, though it has no official link with either the present "Army Week" nor the coming "Wings for Victory Week," may be said to have been timed so as to give moral support to both, is the room of new war pictures which opens to the public to-morrow at the National Gallery, Trafalgar Square.

The room has been hung by Sir Kenneth Clark, Director of the National Gallery, and a visiting member of the Brains Trust, and the collection includes a new drawing by Sir Muirhead Bone (official Admiralty artist), pictures of the war in the Middle East by Anthony Gross and Edward Ardizzone (two official War Office artists), and some further impressions of the Russian front by Feliks Topolski.

Four new artists have pictures in this exhibition, and the only oil painting in the new collection is a composite picture by Evelyn Dunbar.

The Future of Air Commerce

Overseas Air Transport an International Industry : Monopolies : Need for Competitive Standards of Efficiency : "Cheap Speed" the Slogan : Why the Air is Capturing Passenger Transport

By MAJOR R. H. THORNTON, M.C.

HAS aircraft a commercial future? By "commercial" is meant a useful activity the true cost of which is met and distributed spontaneously within the normal exchange of goods and services. The definition applies equally, whether the aircraft be operated by a private individual or by a State. The question is important, because the answer to it affects our whole approach to a number of problems. The answer is undoubtedly "Yes."

At the same time the immediate prospects of air transport have been immensely exaggerated. If you study the prophecies that have been made regarding post-war aviation, you will find that optimism is in inverse ratio to knowledge of the subject. The people who are going to whisk you across the Atlantic at 400 m.p.h. for £10 are the popular writers who could hardly organise a haywagon, let alone a fleet of trucks, ships or aircraft. The people whose forecasts are soberest, and sometimes even gloomy, are the airline operators themselves. They know, as shipowners and railwaymen know, that transport is a difficult business and full of headaches, of which the technical performance of the vehicle employed is probably the least. In short, aircraft has suffered from too much glamour.

MAJOR THORNTON is a partner in the shipping firm of Alfred Holt and Co., and a Member of the Air Registration Board. Before the war he took a very practical interest in aviation, and was among the relatively few owner-pilots of this country. He used his aircraft extensively for trips to Europe, and thus has first-hand knowledge of what air travel meant under I.C.A.N. regulations in the days when each country exercised the "sovereignty of its air."

In this article, which is an abstract of a paper read before the Institute of Export on February 25th, Major Thornton deals in his own inimitable style with many of the problems that have to be faced, and by his figures concerning aircraft and ship pound-miles per horse-power exposes the fallacies of those optimistic forecasts which glibly promise cheap air transport at high speed. In short, he points out that aircraft "has suffered from too much glamour."

Apart from the romantic appeal of human flight itself, its infancy has been exploited and abused for military purposes, into which economic values do not enter. All means of transport, from the horse onwards, are exploited in war, but no other vehicle has yet been swept into the business without having first found its appropriate shape and function in the economic life of mankind.

Work per Horse-power

Aircraft will never be a cheap way of getting a thing or a person from A to B. As a measure of effort, and therefore of cost, take this comparison: An 11-knot ship can propel a useful load of 3.3 tons for one unit of energy. An aircraft can propel only about 9 lb. Give the aircraft, as in fairness you must, the value of its 200 m.p.h. against the ship's 12½, and the aircraft does in an hour 1,800 pound/miles of work per horsepower. The ship does 92,512. Further, both the ship and the aircraft burn petroleum. On a trip of 2,000 miles (allowing the aircraft to stop half-way to refuel) the aircraft will burn 2,040 lb. of fuel for every ton of freight it lifts. The cargo ship will burn about 23 lb. In a world whose petroleum resources are not unlimited, a vehicle which burns 89 times more of it than another to do the same job is hardly a welcome visitor.

Passengers are in a different category. A ton of valuable and fragile merchandise before the war would pay about £10 for a voyage of 10,000 miles in the hold of one of our fast freight and passenger liners. But the first-class passenger in the saloon above, weighing with his baggage only a tenth of a ton, would pay £100 for the same voyage at the same speed. The ship, therefore, charges 100 times more per ton for passengers than for cargo. This explains both the promising start already made by aircraft as a competitor for passenger transport and the extremely slow progress made in the development of air-freight. Incidentally, it exposes the ignorance of the people who tell you that on the morrow of the war substantial portions of the normal and familiar articles of international trade will be carried dizzily at 300 m.p.h. Rubbish.

But although aircraft does not promise cheap transport, it offers a far from prohibitive form of very rapid transport. In other words, for the man whose time is precious, its slogan is "cheap speed." The same slogan applies to any article urgently required. It applies also to anything, from Cornish cream to a daily newspaper, whose delivery many miles away from its place of origin is a marketable luxury, if only it can arrive fresh. It may be said, then, that aircraft has a large passenger traffic, waiting to be stole from existing surface carriers, and a further volume, still to be developed by the dynamic inherent in air transport itself. In the case of freight, it has next to nothing to steal, but a potential traffic to create. Air freight is *sui generis* and still in the womb.

Costs must, of course, come down. But they surely will, though not with the rapidity that some people imagine. Development in design has been steady, but considering the age we live in its tempo has been relatively slow compared with the internal combustion motor car, or even the early steamship. None the less, the military demand, which has so lamentably overshadowed the commercial, has at least stimulated very fast aircraft. On what I might call the "Bradshaw" routes we shall have immediate opportunity after the war to discover to what extent, capably managed, very fast aircraft can reduce the cost of air transport, partly by creating new traffic but much more by its own ability to do more trips in a given time. I believe the effect may be substantial. There are other considerable reductions in costs to be looked for. Improved radio devices will reduce the risk of failures to complete flights due to weather or visibility. This will reduce carriage of excessive fuel and consequent loss of payload. Improved regularity will itself encourage the business man to use air transport 12 months of the year instead of only seven, thus producing steadier traffic.

Tinkering Ratio

Before the war, it was considered creditable for an airliner to achieve as much as 1,500 hours' flying in a year. In other words, for five hours out of six it was on the ground, either idle or being looked over or tinkered with. That is a disreputable ratio for any honest commercial vehicle and implies an extremely high unit cost of operation. We can expect a substantial improvement here, as operating technique both develops greater confidence in

itself and greater assurance in specifying to the manufacturer the difference between good and bad aircraft.

But the greatest reduction in cost must still be looked for from an increase in traffic itself. This surely must occur as the daily life of the world adjusts itself to the wider range of contacts which aircraft confers. Before the days of express trains, a man could not live and work in Manchester and yet attend frequent and regular meetings in London. Now he can. What the train makes possible at 200 miles distance, aircraft already makes possible at 800 miles. What needs time is the adjustment of our own outlook and daily lives to that fact.

The Americans have, we know, a temperamental readiness to try anything once. People sometimes call them gullible. Where air transport is concerned, gullibility has clearly proved its uses. But apart from that, please note that between the two cities of San Francisco and New York, which are as close to each other socially and economically as are Manchester and Liverpool, there lies no fewer than 2,600 miles of solid country. The same distance separates London and Baghdad. And that whole vast expanse of territory is subject to one Congress, one language, one economic system. In short, the need for adjustment is largely met before the aircraft even exists. It is Heaven's gift to air transportation. The domestic air lines of the U.S.A. already carry an annual traffic of about three million passengers and fly ten million miles a month.

On any trans-Continental route, with short fuel stages and a large industrial and commercial population, the true cost of an air passage should fall fairly rapidly to about 3d. per seat-mile—in terms of pre-war currency. I should call that "cheap speed." But of what use will that be in poor old Europe, where you can hardly fly for half an hour without being challenged as an alien and asked to change your language, your money and your laws, let alone your political convictions? In short, the value of aircraft to European civilisation depends upon the extent to which we are prepared to be consciously European in our civilisation.

If aircraft for its consummation in Europe requires the growth of a new Europeanism, then let us at least give it a chance by ensuring that all the conditions of its operation within Europe shall be internationally conceived. After all, even after the last war we contrived an International Air Convention whose pious preamble was such as to satisfy the most exacting evangelist of that date. But, except for some codification of a technical nature, no constructive attempt was ever made to implement its spirit. On the contrary.

Article 15

A single, harmless-looking sentence in Article 15 gave every State the right to "make subject to its prior authorisation" the establishment of any air line over its territory, even though not proposing to land there. This modest reservation was wrung from its context and elevated into a major principle. Under its protection enterprising services were forbidden to start, others were suspended or diverted under pressure of blackmail exerted on some wholly different route. And this shoddy bargaining was not, you observe, the product of the much-maligned profit motive. In every case the negotiators were Government servants acting in loyalty to what they conceived to be the interests of their countries.

Cannot we Europeans do something better than this when our normal life is re-established? Many of us are here in England. Are we laying the foundations now? At least do not let us get entangled in legalistic arguments around the phrase "Freedom of the Air." Nobody wants a State to abandon ultimate sovereignty over its own air. All that matters is what it claims to do in the daily application of that sovereignty to peaceful and innocent air traffic.

By all means reserve the right to forbid, interrupt or divert all foreign aircraft, but abandon the right either to refuse passage to individual air lines or to dictate your own regulations regarding any aspect of international aviation which is covered by an international code. This code already standardises certain essentials of airworthiness, technical competence, navigational discipline, and many minor matters. Not only should it be extended in scope and authority, but the trunk air routes of the European network should be internationally planned and equipped, and the main airports on these routes should be internationally controlled and virtually extra-territorial in status, as was once the great Free Port of Hamburg. Nothing less will suffice, if the dynamic of air transport is to obtain the same outlet here as elsewhere, and aircraft is to develop the same easy stride across the chequered map of Europe as it already makes across the great continental stretches of Russia, China and North America.

THE FUTURE OF AIR COMMERCE

By MAJOR R. H. THORNTON, M.C.

(Continued)

All this, of course, is contingent upon the question of subsidies. And in subsidies I include not merely the granting of external aid to an otherwise commercial venture, but the operation of wholly State-owned services at less than true cost. No practical measure of freedom for air traffic, such as I have advocated, can ever be achieved if States are to adopt individual policies of persistent and arbitrary subsidy. Indeed, the hopes of development for any healthy and genuine air commerce at all are involved in this question.

International Air Stakes

Is civil aircraft to remain for ever a high-speed thoroughbred entered, regardless of cost, for the International Air Stakes with one jockey per nation? If so, with what object and for whose benefit?

If we really wish to give artificial stimulus to the development of aircraft as an instrument of civilisation and not as a potential troop transport, it is easy enough to do so. To all aircraft engaged in international flight let us give free radio and meteorological services, and at our new extra-territorial "European" airports free landing rights and hangarage, and even, if we wish, fuel at a special international price. Let us pool the cost of all these concessions in the same spirit in which we have established for years the postal union of the world. But let us give none of these concessions to any aircraft whose operator, be he private individual or State, refuses to submit his costings to the scrutiny of a permanent international commission.

Subject to that degree of effective control, let us leave aircraft free to prove in honest and open competition both the competence of its operator and its own final contribution to the economics of our daily life. If we cannot achieve that measure of unanimity and cohesion, then I suppose we must "reserve all our rights" and settle down once again to the jolly atmosphere of the existing Air Convention, with its jockeying for position, its lobbying for "rights," the irritating farce of its Customs regulations, its vast "prohibited areas," its babyish "corridors."

There is a school of thought which suggests that the solution for all these problems is a grand International Air Transport Corporation. In a Europe whose Europeanism is so tenuous that it could not even achieve the modest degree of cohesion I have suggested, how could such an organisation ever come to fruition or, if it did, prove anything but a perpetual nightmare to the unfortunate gentlemen entrusted with its daily administration?

All these are questions in which Chambers of Industry or of Commerce, and bodies such as the Institute of Export, should take an immediate and practical interest. Transport is essential to trade and, therefore, the kernel of all material civilisation.

The policy of the British Government of 1939 was that service was to be given by a single monopolist Corporation. The British Government of to-day being so far inarticulate

THE FUTURE OF AIR COMMERCE

on the subject, we must assume the policy persists, and, indeed, it is true that individual shipping companies who have offered to establish air services and thus contribute their share to a great national effort in the air, have received replies from the Department of Civil Aviation wholly discouraging in tone.

For my part, I have no strong feelings on the principle of monopoly as such. I merely do not believe that statutory monopolies of great *expanding* undertakings are a policy to be encouraged in any democracy, least of all an English democracy. In an English democracy, a monopoly, to approach efficiency at all, must first surmount our great besetting sin of complacency, described by us—but not, you observe, by anyone else—as our sense of humour. If that obstacle proves, as it almost inevitably must, insurmountable, then the resulting inefficiency will be effectively shielded from reform by our Parliamentary institutions and our own national tolerance.

Meanwhile, in the United States you have no such policy of monopoly. The internal air-lines of the Union are conducted by no fewer than 18 separate and independent enterprises. True, they operate under licence, but the licences are so granted as to leave ample scope for competitive services. True, too, that in the early pioneering stage their external services were almost wholly confined to one Corporation. But monopoly has never been the declared policy. Already there are two American air-lines on the North Atlantic, and there is no reason whatever to suppose that the tendency will not develop similarly in other directions.

The Americans then possess, in contrast to our tiny island, a vast home market for air transport. Its development is in the hands of a highly competitive industry, whose managers have already shown a splendid combination of scientific thoroughness and commercial zest, which fully entitles them to their present and any future successes. This industry, in turn, provides admirable opportunities for the recruitment, training and ultimate selection of first-grade technical and administrative personnel. The expansion of American overseas air services after the war will be rapid and extensive, but its rapidity will be derived not so much from the mere possession of a large fleet of transport aircraft (we may have plenty, too) as from the strong springboard of technique and experience already gained and the confidence, derived therefrom, with which they will go about their work.

An International Industry

However it may be conducted, overseas air transport, like ocean shipping, is an international industry, by which I mean that the highest standard of efficiency set by one participant must be attained, or at least nearly approached, by all others who wish to avoid gradual elimination. As a country we can claim no right whatever to a substantial share of this great new development of world transport unless we are ready to subscribe fully to this duty of equalling the best. In this case it is, as I have explained, a fine and very stimulating best. If we are to rise to it, you may feel that, so far from putting all our money on one horse, we shall need to mobilise on the broadest possible front all the assets, all the experience and all the initiative that we can, and to ensure that, within the framework of a national plan, there shall be ample scope for variation of method and for competitive standards of efficiency.

ROADS TO FREEDOM

PRIDE of place on the walls of a Polish squadron's crew room at a North of England bomber station is occupied by a map which illustrates the history of the squadron's flying men.

It shows the devious routes by which they escaped from Poland after the Germans overran their country. It also shows the routes to German and Italian targets taken by the bomber crews on their trips from the station in Wellington aircraft. It is a large map, taking in Europe, Eastern Russia, the Mediterranean and part of North Africa. Two flying men made it in their spare time. They cut out the countries in plywood, coloured them, and fixed them to a base of plaster-board.

Important places which the Polish airmen reached on their way from Poland to France and Britain are marked by short nails, and the routes between these points are joined up with blue twine. They show that men passed through Rumania, Jugo-Slavia, Greece and Italy to reach France. Others escaped from internment in Russia. Some went to Syria and then sailed to Marseilles. Others touched at ports in North Africa.

From France lines radiate to Britain. There is one blue string from the Atlantic to Britain, marking the route of three American Poles who volunteered to fight with the squadron. Yellow strings run straight from North England to Milan, Turin, Lorient, the Rhine, the Ruhr and all the important German towns bombed many times by the Poles. Whenever the squadron hits a new target another yellow route string is added.

ETHIOPIAN EMPEROR'S GIFT

THE Emperor of Ethiopia has sent to the Secretary of State for Air a present of fifty-eight golden rings, weighing in all 100 ounces, and worth, at the present price of gold, £700. In a personal letter to Sir Archibald Sinclair accompanying the gift the Emperor wrote:—

"I have been following with special interest the gallant actions which the Royal Air Force accomplish daily. I have the highest admiration for them. It is within my recollection that the brave soldiers of the British Air and other Forces have sacrificed themselves in this amazing contest of aerial warfare, and have, as a result thereof, been wounded and disabled. My deep sympathy is directed to them and to their families.

"As a token of my great admiration and sincere sympathy to those members of the R.A.F. who are either wounded or disabled consequent to the carrying out of their duties and who deserve foremost consideration in the crowning of victory, it gives me great pleasure to send herewith 100 ounces of gold, which I wish to be utilised for the benefit of the wounded and disabled."

Sir Archibald Sinclair has handed over this gift to the R.A.F. Benevolent Fund.

AN AMBASSADOR FLIES

HIS Excellency the Brazilian Ambassador, Dr. Moniz De Aragal, recently paid a visit to a unit of Coastal Command in South-West England. Accompanied by his military attaché and a supporting officer from the Air Ministry, the Ambassador flew from London, and on arrival was welcomed by the Air Officer Commanding.

His Excellency spent a long time at an area combined headquarters, where he was very interested in the operational and intelligence organisation. Later, at a flying-boat station, he saw four-engined Sunderlands which have taken leading parts in the anti-submarine activities, and had a flight in one.

The squadron has been on active service with Coastal Command since the outbreak of war, and the Ambassador was keenly interested in hearing something of its many achievements.

At lunch the Ambassador was the guest of the Naval Officer Commanding-in-Chief, and later he dined with the Air Officer Commanding. Next morning his Excellency made a tour of areas of a nearby city which have suffered in air raids.

DISTINGUISHED VISITOR

SIR JOHN COLVILLE, Governor Designate of Bombay, recently visited the Bombay Spitfire squadron at a front-line Fighter Command station.

He there met Sqn. Ldr. D. E. Kingaby, D.F.M. and two bars, the Squadron Commander, who has destroyed 21 aircraft, and talked to pilots and members of the ground staff.

Later, Sir John saw films of actual combat in which the pilots had been engaged and which had been photographed by cameras installed in their Spitfire aircraft. He also attended a briefing during which the pilots received their instructions for an operation in which the squadron was about to take part.

INDUSTRIAL MANAGEMENT

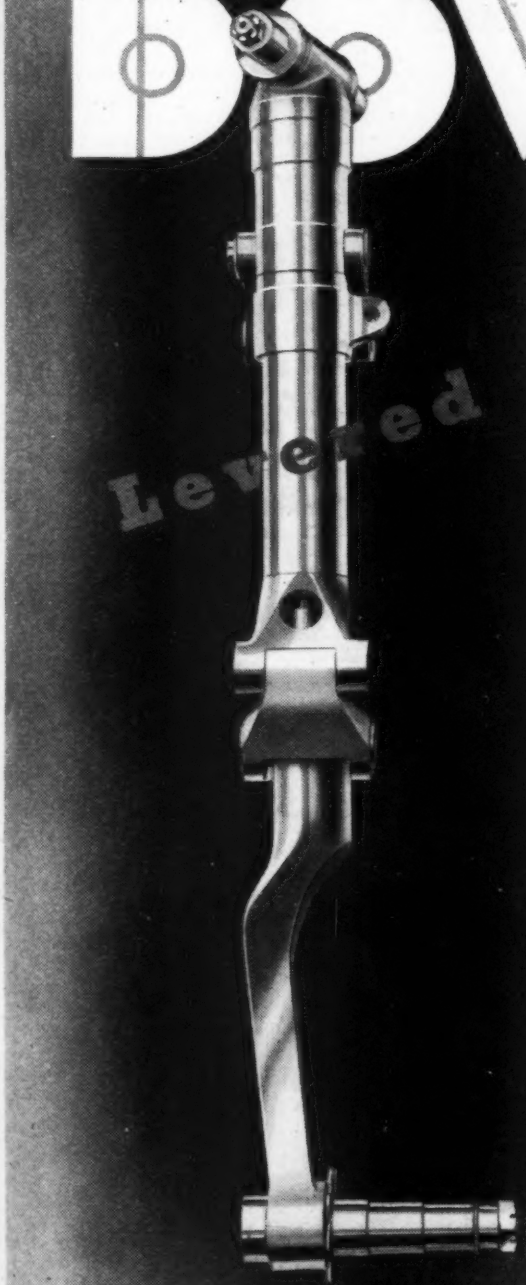
MR. S. J. NOEL BROWN, for many years secretary of General Aircraft, Ltd., has severed his connection with that firm and has established offices at 29, Palace Gate, London, W.8, where he will act as industrial management consultant. There can be few aspects of this subject with which Mr. Noel Brown has not come into contact during his long experience.

DOWTY

Levered Suspension

in another form

FOR SIDEWAYS RETRACTION



DOWTY EQUIPMENT LIMITED

Thirty-eighth of the Latest Recognition Series

Aircraft Types and

MARTIN MARS

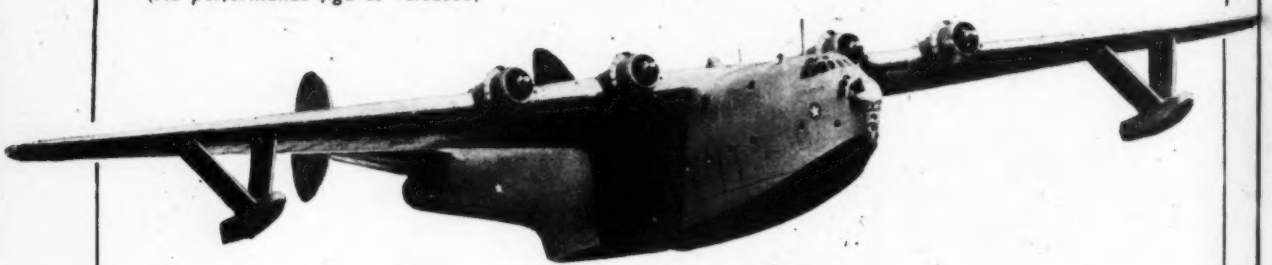
ORIGINALLY intended as a "flying battleship," the Martin 170, Mars, which is the biggest flying boat in the world and has the U.S. Navy designation XPB2M-1, was recently announced to be undergoing conversion into a transport. According to Glenn L. Martin, it is being stripped of its "tactical equipment" to make room for bulky and heavy freight.

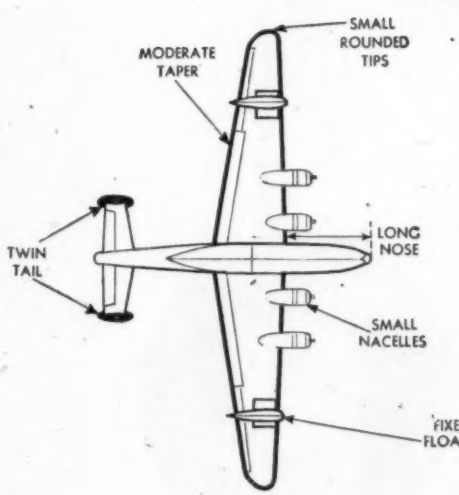
Launched in November, 1941, the Mars came very much in the limelight when that high-speed builder of surface ships, Henry J. Kaiser, voiced his desire to produce the type in large quantities by turning over nine of his shipyards to aircraft production. There were many in America's aircraft industry who openly questioned Kaiser's ability to repeat his shipbuilding "miracle" in terms of flying boats. Kaiser, however, went straight to the fountain head at Washington, with the ultimate result that he was given an order to build 100 Mars-type cargo flying boats. The order, however, was later cancelled, and Glenn Martin himself said that the Mars was not really up to date now. Kaiser, therefore, transferred his energies to another even larger type, and is reported to be tackling a monster craft with seven engines. So far, of course, the Mars is the sole experimental example of the Martin 170, and, as such, its performance and other vital data are a military secret. A certain amount of information about its construction is, nevertheless, available for the benefit of the recognition student.

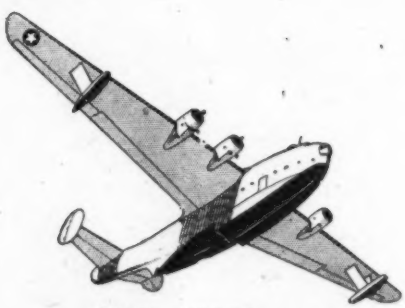
Powered by four Wright Duplex Cyclone engines of 2,000 h.p. each, it has tapered, high aspect-ratio wings of no less than 200ft. span, a deep, slab-sided hull, and is very much like a scaled-up Mariner, of which it is is a development. The slightly tapered dihedral tailplane of moderate aspect-ratio is mounted across the top of the hull's rear extremity, and carries inclined twin "end-plate" fins and rudders symmetrically oval in shape. Fixed stabilising floats are attached beneath the wings by "V" struts about 20ft. inboard from the rounded tips.

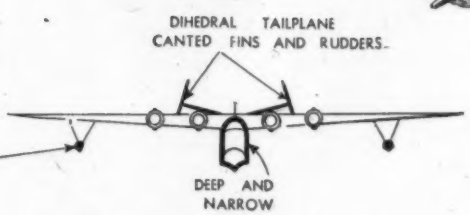
Of all-metal construction with stressed-skin covering, the tail end of the hull, which tapers to the dimensions of a gun-turret, is upswept on its top surface as well as from the second step. The weight of the Mars is 70 tons.

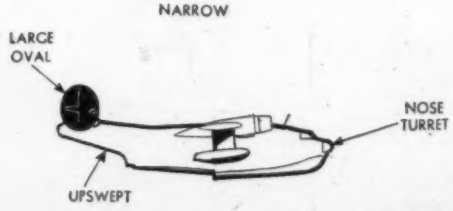
(No performance figures released)











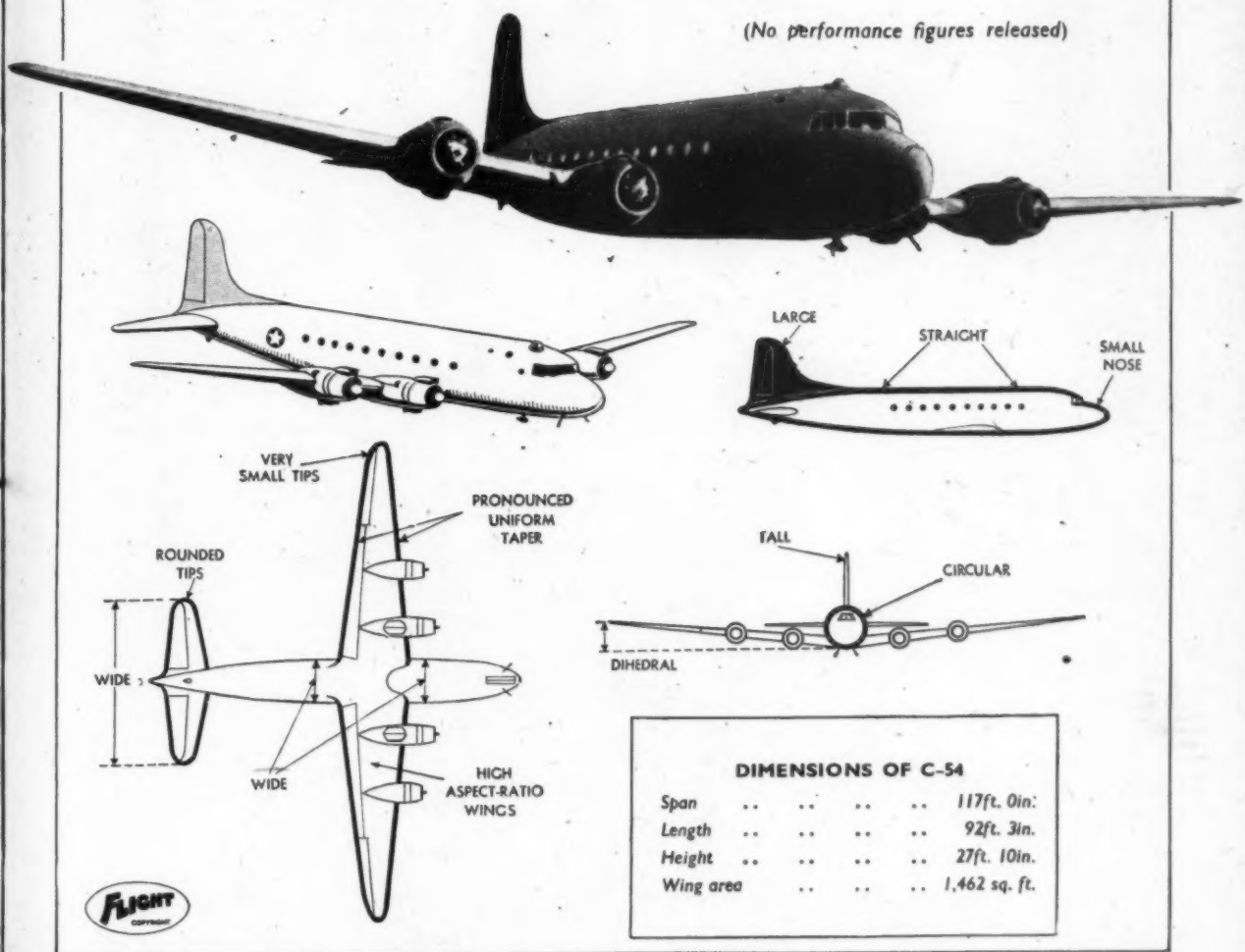
DIMENSIONS OF MARS

Span	*200ft*
Length	*117ft*
Height	*36ft*
Wing area	*(approx.) 2,350 sq. ft*

FLIGHT COPYRIGHT

dTheir Characteristics

DOUGLAS SKYMASTER



DIMENSIONS OF C-54

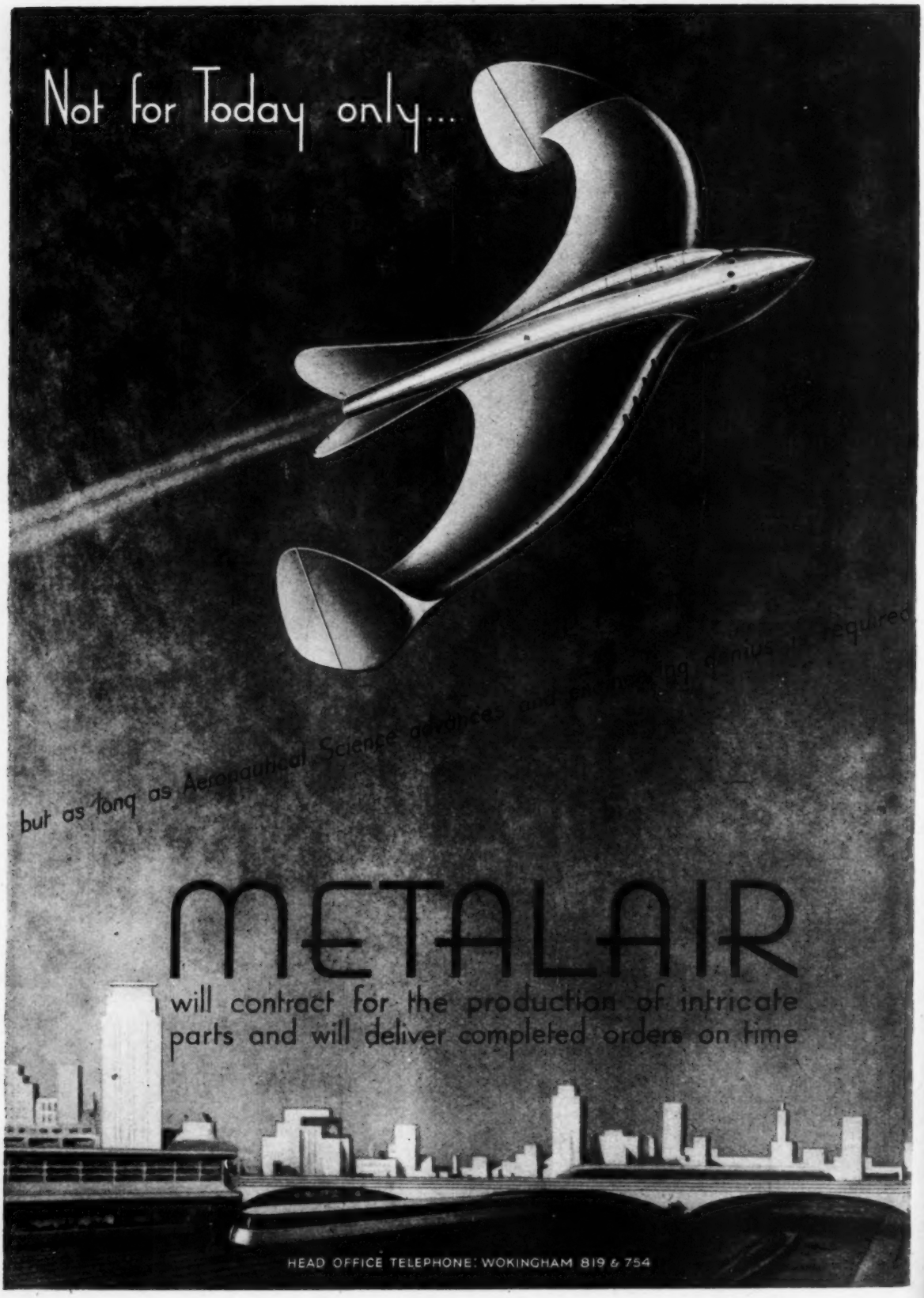
Span	*117ft. 0in.*
Length	*92ft. 3in.*
Height	*27ft. 10in.*
Wing area	*1,462 sq. ft.*

THE Douglas Skymaster, or C-54, is basically the Douglas DC-4 commercial airliner converted for use as a military transport and troop-carrier, and is one of the latest of the American four-engined airliners so to be pressed into service to cope with the growing demands of the Allied Forces for air transportation.

No official data on its performance as the C-54 have yet been issued by the U.S. authorities, but it can be reasonably assumed that they will not differ appreciably from those of the same aircraft in its passenger-carrying guise. As regards its accommodation, it will be some indication of the potentialities of the C-54 to say that, as the DC-4, it could carry 40 passengers in comfort by day and 28 by night, and included a stateroom, separate lounges for men and women, lavatories with hot and cold running water, galley, luggage compartments, and a host of luxury equipment, from electric curlers for the ladies to a complete telephone system. In all, the DC-4's fuselage was divided into eight different compartments. Clearly, when all this interior equipment gives place to the spartan requirements of war freight, handled by a comparatively small crew, the available space within its 90ft. fuselage will be considerable.

The power plant consists either of four Wright Cyclone nine-cylinder geared and supercharged engines, each rated at 1,000 h.p., or four Pratt and Whitney Twin Wasp 14-cylinder engines each rated at 1,050 h.p. (also geared and supercharged). In either case, three-bladed Hamilton-Standard hydromatic airscrews are fitted. The top speed of the DC-4 was 257 m.p.h. with the Cyclones, and 259 m.p.h. with the Twin Wasp engines, which also gave a service ceiling of 25,300ft., as compared with 24,300ft. with the smaller engines. The cruising range with the Wright engines was, however, some 60 miles more, at 2,600 miles, than with the Twin Wasps. But the most important gain with the larger engines was in cruising speed, which, at 244 m.p.h., was some 10 m.p.h. better.

Fitted with a tricycle undercarriage, which provides the advantage of a level floor for loading, the Skymaster is characterised by its high aspect-ratio tapered wings and tailplane, well streamlined, roomy fuselage, and typically Douglas single fin and rudder. The original DC-4 had a triple tail but the fitting of a single fin and rudder was one of several modifications which were carried out before the Approved Type Certificate was granted. The C-54 should carry over 5 tons.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Behind the Lines

Service and Industrial News from the Inside of Axis and Enemy Occupied Countries

More Generals

THE German press announces the promotion of the following senior officers of the *Luftwaffe*:—To the rank of *General der Flieger*: Lt.-Gen. Patersen and Lt.-Gen. Schultz. To the rank of Lt.-Gen.: Major-Generals Schubert, Wagner, Becker, Scheurlen, von Egan-Kriegen and Lackner.

Jap Emancipation

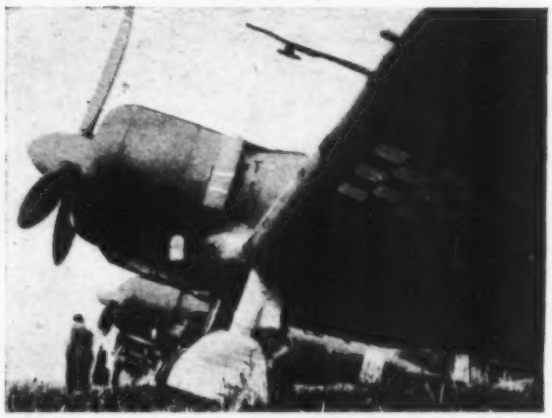
IT is reported from Japan that, similar to the recent reorganisation of the Army Air Force, separate H.Q.s of the Naval Air Arm have now been established.

With the appointment of Vice-Admiral Tsukahara as Chief of the new Naval Air Force H.Q.s there appears to be a gradual tendency to separate the command of the air branch from that of the rest of the Navy. Until now Admiral Yamamoto was considered to be C.-in-C. of both the Japanese Fleet and the Naval Air Service.

Honourable Yanks

Il Popolo d'Italia published recently a despatch from a correspondent in Tokyo who interviewed some Jap pilots just returned from the Solomons. In the opinion of the Jap fighter pilots the Grumman Wildcat single-seater fighter is the best aircraft the Americans have shown, and its speed and high manœuvrability is fully appreciated by the Japanese. The Bell P39, Aircobra, the Curtiss SB2C Helldiver, and, among bombers, the Flying Fortress, are considered by the Japs as commanding respect.

In an attempt to appraise the fighting qualities of the Americans, the correspondent writes that they are esteemed by the Japs for their excellent pilots, accurate gunnery, and hard fighting. Describing tactics usually employed by American fighters, it is said that they climb to 25,000 or 30,000ft. and then make a dive pass at the Japanese formations, avoiding dog-fights. This seems to be a healthy way of getting at the Jap, who, with his highly manœuvrable Zero, is most dangerous in close combat.



FOR EXPORT. Fiat G50 supplied to the Croatian air units in a modified form. The new version is a two seater and embodies a redesigned undercarriage and a new streamlined airscrew hub. For the present only few aircraft of this type have been delivered.

Sacked

FOLLOWING R.A.F. raids on Italy, the Chief of the *Unione Nazionale Protezione Antiærea U.N.P.A.*, the national A.R.P. Union, Giuseppe Stellingwerff, has been relieved of his post and replaced by General Luigi Gambelli.

For reasons hitherto undisclosed, Signor Aldo Finzi, who held the post of Deputy Commissioner of Aeronautics from 1923 to 1942, has been expelled from the Fascist Party.

Satellite Air Force

EARLY in January Marshal Kwaternik was retired, and General Vlado Kren appointed to command the Croatian Air Force. The High Command of this Air Force is composed of an air staff, with an operational, an intelligence and a personnel section, an anti-aircraft and A.R.P. command and the Observer Corps command.

According to reports, 75 per cent. of the personnel are Croatian ex-members of the Jugoslav Air Force, and only 25 per cent. are newly recruited and still mainly by German and Italian instructors, while some of the officer-cadets, who have taken their training in the Belgrade Military Academy, are now reported to be continuing their studies at the Italian Air War Academy at Caserta. The strength of this Air Force is composed of two groups operating in Russia and two wings in Croatia, with headquarters at Zagreb.

Among the variety of equipment with which the Germans have supplied their satellites are Heinkel 111s, Dornier 215s, Caproni 310s, and Fiat G.50s.

Luftwaffe Appeal

THE losses suffered by the *Luftwaffe* appear to have affected specially their maintenance branch. An appeal to all Germans born in or before 1925, published recently in the German Press, urges them to volunteer for engineering commissions with the *Luftwaffe*. Significantly, candidates do not have to be fully qualified technicians, but to be in possession only of a matriculation certificate or of similar educational standard.

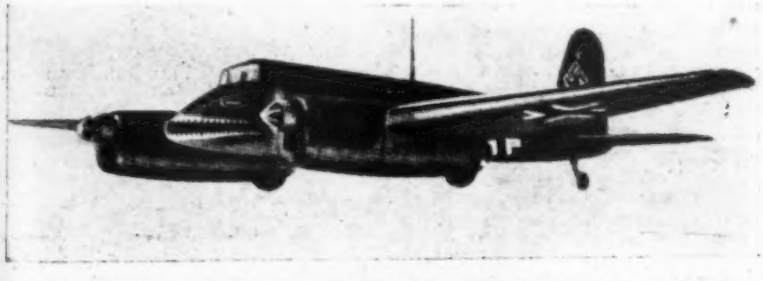
Students of technical colleges who have been deferred to continue their studies are now urged to apply for engineering commissions. On acceptance, candidates are given a short specialised training and are posted as officers with the different technical branches of the *Luftwaffe*.

Italian Defence

WITH the increased attention paid by the R.A.F. to Italy, the Italians are devoting more care to their A.A. defences. Axis sources have recently reported the arrival of German A.A. batteries in Milan to strengthen local defences, and a statement issued in Italy gives the following details of defence organisation.

The Deputy Chief of Staff for Home Defence in the Italian War Office is in charge of the A.A. defences, which are carried out by fighter and A.A. Artillery Commands of the Italian Air Force, and by the A.A. artillery militia formations. A Directorate-General for Passive Air Defence in the Ministry of Interior controls all A.R.P. measures and is assisted by Regional A.R.P. Committees (*Comitati Provinciali di Protezione Antiærea*) and the Union for Passive Defence (U.N.P.A.).

While the Regional Committees are charged with the preparation of A.R.P. measures, the U.N.P.A. maintains regional commands responsible for propaganda, the enforcement of air-raid precautions, the construction of shelters, the recruiting of auxiliary personnel and for the sounding of air-raid alarms.



FOR GROUND ATTACK. The Henschel Hs 129 is Germany's most heavily armoured aircraft. Powered with two Argus engines of 450 h.p. it carries an armament of two 7.9 mm. and two 15 mm. guns on the sides of the fuselage. A 30 mm. cannon (according to neutral sources 37 mm.) is carried below the fuselage. Details and a general-arrangement drawing of the Hs 129 were published in *Flight*, Feb. 18th, 1943.

INTO BATTLE: Chinese bomber crews preparing for a sortie. Before Germany's attack on the Soviets the Chinese received quantities of aircraft from Russia, among them the SB.2 seen in this picture. But at present aircraft supplies are urgently needed to increase the offensive power of China's Air Force.

China in the Air

Her Modest Air Force Used with Great Ingenuity : Up-to-date Allied Aircraft Types Needed for More Offensive Air Policy

By V. L. G.

FOR over five years wave after wave of Japanese hordes stormed the walls of China, and although they have achieved some territorial gains they are still far from a decision. It is not the Great Wall, which in the ancient days defended them against the impact of desert people, that has helped the Chinese in their battle against modern aggression. Rather is it the indomitable spirit of resistance which has been forged into China's main weapon and given her armies that staying power which they have so valiantly displayed ever since they were attacked.

At the beginning China stood alone, apart from such meagre assistance as was rendered sporadically to General Chiang Kai-shek's Government by friendly powers, or by keen business enterprises for whom an attractive field of activity was opened.

Nevertheless, consistent efforts were made by the Chinese to establish their Air Force on sound foundations and to increase its strength.

This Air Force, although modest in its numerical strength, has not been an outcome of Japan's aggression. It has grown out of the separate Forces maintained by the different provincial governments, together with the process of China's unification under a National Government.

In 1928 the completion of this process had been achieved and the entire air organisation unified under the central authority of Generalissimo Chiang Kai-shek's Government. Equipped with American, British, German and Russian types, the unified Air Force grew steadily in size: from five squadrons (three of which with land-based aircraft and one with seaplanes) to eight in 1934, and fourteen squadrons in 1935.

From motives obviously other than profits or markets for their aircraft, the Russian Government gave China steady support, and thus contributed materially towards cementing the foundations of China's resistance. So far as the Air Force was concerned, this help mainly took the form of lending Russian technicians and instructors to the Chinese maintenance staff and also pilots and aircraft. Among the latter were the J-14 and the J-15 fighters and some SB-2s. At that time these aircraft were adequate, comparing favourably with the types encountered by Chinese airmen, and they rendered invaluable service. But with Russia itself plunged into war against Germany the supplies petered out, leaving China dependent on the Burma Road. True, the Chinese Air Force still had J-15s, but by then they were no longer a match for the more modern types since developed in Japan, particularly the "O" fighter.

Chinese Ingenuity

When Allied supplies began to reach the Chinese they hoped that again their Air Force would be able to meet the Japanese aggressor equipped with weapons as good as his. Neither superiority nor even numerical parity was wanted for this aim. Just sufficient modern equipment to meet the Japanese in the air. That alone would have been a tremendous asset in the hands of the fighting

Chinese. For the Chinese does not overestimate the striking power of the Japanese Air Force, nor, for that matter, does he indulge in underestimating his enemy. His views are rather based on the balanced deduction from his experience of years of hard fighting, and as such they merit the special attention of the other Allies.

Experience has shown that despite the enemy's overwhelming air superiority, Chinese forces can inflict heavy losses upon him and often wrestle from him the tactical initiative.

Initially, of course, the Chinese troops found Japanese air support a most alarming feature of warfare. Gradually they not only grew accustomed to it, but they developed a special defensive technique which took the sting out of the enemy's attack. Chinese troops have developed a method of camouflage, primitive in its simplicity, which in its conception most truly resembles the mimicry of nature. They have learnt the difficult art of lying motionless during an enemy air attack, and they carry cone-shaped, locally made straw hats which are always painted in harmony with the surroundings. When the troops move to another locality the hats are easily repainted to suit the new conditions.

Japan's Material Advantage

Primitive as these methods may appear, they have saved the lives of millions and have stood the Chinese in good stead. In fact, together with other devices and ruses, they have been developed to such a pitch that more often than not the Chinese are able to stand their ground without any air cover. That the Japanese have not been able to blaze their way through with their air weapon is ample testimony to the efficiency of Chinese tactics.

In the majority of operations the Chinese have to rely almost exclusively on their ruses for deceiving Japanese aircraft. This fact has enabled the Japanese to employ in close support all sorts of aircraft which are far from being real first-line types. The advantage so gained enables the Japanese to employ their more modern first-line equipment elsewhere to the best strategic advantage without the necessity of dispersal of that strength on the Chinese and on other fronts. Such preservation of the enemy's strength on

SKILL : Chinese mechanics at work on a damaged Tomahawk fighter aircraft of the A.V.G. squadron. These men show a remarkable adaptability, are intelligent, and, while many are fully trained, even the novices among them quickly grasp the intricacies of modern aircraft.

DISPERSAL POINT : These simply constructed huts have been built on many airfields to conceal the precious aircraft from the eyes of Japanese intruders.

CHINA IN THE AIR

chosen sectors is obviously undesirable from the Allied point of view, and can only be remedied by reinforcement of China's air strength.

Moreover, while the Chinese "passive" skill has been so successful, the word itself implies that a good deal of the aggressive spirit and offensive capacity of the troops is lost by the enforced delay in operations, and through being pinned down. In the words of a Chinese divisional commander, "Only one or two aircraft would often make all the difference." It would prevent the Japanese from using numbers of obsolete aircraft, and it would give the Chinese soldier that extra margin of operational freedom which, deprived of air support, he has frequently to forgo.

A machine-gun post of a Chinese Airfield Defence unit. Chinese troops are masters of camouflage methods, a fact which compensates them to some extent for their frequent want of air cover.

The authority controlling the Air Force and all matters connected with air development is the Commission of Aeronautical Affairs which emerged in 1934 from the Aeronautical Bureau. It is composed of five departments, including a separate branch for A.A. defence.

As soon as hostilities against Japan broke out, Operational G.H.Q.s were established in the front line to direct air operations against the enemy. With the advance of the Japanese Forces these G.H.Q.s had to be moved periodically farther inland, until a final reorganisation took place in March, 1938. The Air Force G.O.H.Q. was then reformed into three separate commands, namely, the first, second and third Route Commands. The main object was to render the organisation of the Air Force more mobile and to tighten up the already close co-operation with the land Forces. This step was, in fact, responsible for the successful tactical employment of the small Air Forces collaborating with the ground Forces in the widely spread battle areas.

The Chinese use their modest Air Force with great ingenuity and economy. Facing numerical superiority, the Chinese have certainly, with unsurpassed ingenuity, developed such tactics as are most suitable to their position.

ACTIVE DEFENCE: A wireless post at an Air Defence Headquarters directing fighter operations. These strongly camouflaged posts exist all along the fighting front.

Tactics

First comes the perfection of their intelligence work. The Japanese rarely undertake the simultaneous bombing of several sectors, possibly because of the weakness of their bomber command, or possibly in an attempt to preserve their strength. They concentrate for a period on one zone at a time, the units then moving to raid another locality, or they are sent back to Japan and replaced by a fresh force. By following these movements, Chinese intelligence knows in advance which direction "the wind blows." Accordingly, Chinese fighter units are immediately transferred to the zone which is expected to be bombed. In this manner the modest fighter strength can be used as effectively as possible.

Needless to say, the Japanese have also developed and changed their methods. In fact, it has been observed that since Japan's affiliation to the Axis, and the arrival of German instructors, their tactics have considerably improved, although their aiming still remains poor. At first, one of the favourite methods employed by Japanese raiding aircraft was to fly straight on to the objective. Because of the heavy losses sustained, these tactics were subsequently abandoned, and a small number of fast "path-finding" aircraft, such as the "O," would fly ahead of the main force, approach the target area at good height and try to engage the Chinese fighter defence.

Chinese fighters going up to engage the enemy would find no bombers, and after a brief combat, or a short stay in the air, they had to go down to refuel. At that instance Japanese "path-finders" signalled to their bombers which were hovering about some 40 to 50 miles away; they would then make a rush for the target, dispose of their bombs and be off. Before the Chinese fighters could take off, all was over.

A counter method developed by the Chinese was to remain at dispersal points in the target area, refuse to be attracted by *any* Japanese aircraft, and to wait for the bombers to come in sight. Then the Chinese fighters would take off and engage the enemy at the last moment.

The scarcity of equipment restricts the operational free-

TOTAL WAR : Chinese women and children helping in the construction of a new airfield, with a Mitchell in the background. With the vast distances in China a close net of landing facilities is of great importance to the operations of China and her Allied forces.

CHINA IN THE AIR

dom of Chinese fighter units. On the whole, their machines are not a match for the latest Japanese aircraft. Even the P40 of the A.V.G. squadron has proved inferior in manœuvrability to the Japanese "O" fighter which, with its low-wing loading, is a most dangerous foe in close combat.

The Need of Aircraft

What is needed is to provide the Chinese Air Force with first-line fighter aircraft, the possession of which would enable them to develop a more offensive air policy. If such supplies were augmented by bomber units or aircraft distributed in the depth of China, they could give every effective help to drain Japan's air power and to support the Chinese forces in their operations. The difficulties connected with the transportation of such supplies cannot be underestimated. But even if the closing of the Burma route has seriously complicated the problem of overland transport, different routes can be, and certainly are, employed for aircraft.

At present China has been included in the lease-lend arrangements, and both her British and American Allies provide her with quantities of war material. What is wanted, however, is more urgent attention to the needs of the Chinese Air Force in respect of material. So far as personnel and landing facilities are concerned, they do not represent a problem. The Chinese have an excess of potential personnel and have continuously maintained the training of crews well in excess of operational requirements, even though the lack of operational aircraft prevents them from actually employing these crews in combat.

Under the Commissioner for Aeronautical Affairs, who is assisted by a Chief of Staff and who is directly responsible to the Generalissimo, modern methods of training have been instituted and training centres organised.

As far back as 1932 a beginning was made to introduce expert aeronautical training by the establishment of a central Aeronautical College, subsequently transformed into an Air Force Staff College. Later, branches of this institution were opened in different parts of China and aeronautical faculties organised at some universities. In addition, a separate Mechanical College was formed for the training of Air Force maintenance engineers and mechanics. Separate schools for pilots, navigators and gunners are in existence, the majority of instructors being Chinese, with a sprinkling of foreign advisers. The standard of flying, and especially of air gunnery, is as good as can be desired. And all this is done in the expectation of aircraft supplies to come from China's Allies.

It would be unfair to their gallant endeavours if an impression were conveyed that the Chinese Air Force authorities merely sit back and wait. In point of fact, no effort is spared to establish the necessary facilities for such supplies as are hoped for, and for the development of any possible local resources. Adequate landing fields have been built.

Despite the lack of skilled labour and material, the beginning of a local aircraft industry has been made. A version of the now obsolete J-15 fighter is being locally built as a training aircraft. It incorporates some modifications, such as more flexible gun mountings and easier servicing, made by the Chinese. Another trainer of Chinese design constructed of local spruce is being tried out. For these aircraft the Chinese use reconditioned engines, of which ample quantities have been preserved in the course of years.

With all their difficulties and shortage of equipment, the Chinese Air Force has displayed the maximum possible activity and aggressive spirit. But here as elsewhere, each aerial engagement means sacrifices in men and machines, with the marked difference, however, that in China the replacement of material losses presents the greatest difficulty.

Following the conclusion of the Japanese campaign in Burma, when the bulk of the Japanese forces were directed against the Tchekiang Province, furious air engagements between the Japanese and the Chinese Air Forces are said to have taken place. The Tokyo "Asahi Shimbun" then reported triumphantly that Marshal Chiang Kai-shek's Air Force had dwindled to 90 units, 20 of which were fighters. While the accuracy of this statement is likely to be just as reliable as any other Axis communiqués, the jubilation in the Japanese Press signifies the importance which they attach to China's Air Force. The building up of the offensive power of China's Air Force, which can only be accomplished with Allied help, would turn this force into a factor which could materially influence the fight of the United Nations against Japan.

Topics of the Day

There is Still the Future

To-morrow Must Not be Just Another Day: The Need for Immediate Airline Organisation After the War : Flying People and the "New World"

MAYBE there is nothing new under the sun. I have no doubt at all that the troops of Darius, five hundred years before the present date-line, pushed on thinking, if they thought at all, of the new world they would like to make. Seven hundred thousand of them, if I remember rightly, crossed the Bosphorus by a bridge of boats to subdue Thrace and Macedonia (invaders and prospective invaders please note that seven hundred thousand and that bridge of boats), only to be led on by the retreating Scythians (Germans please note) as far as the Volga and losing eighty thousand men then and in the retreat back to the Danube.

People have always, especially at times like these, been making new worlds in their minds, but by the time they have finished a war they are usually so tired, and often so full of hate and all uncharitableness, that they are incapable of putting their ideas into effect. Furthermore, and not unnaturally, they are rather busy making a living for themselves—a job that is particularly difficult after a war, during which all the best jobs and all the good things have so often been taken by people who were much too sensible to go and die on a field of battle.

We are very proud of the twentieth century and its accomplishments. Rightly so. We've made it possible for the people of the world to live in comfort and security for the rest of their days by reason of the mechanical devices we have perfected. All that is needed is a little organisation, so that the fruits of this mechanical civilisation shall not escape us. And if ever we feel *too* proud we have only to think of our mistakes, of the good ideas people had thousands of years ago, and, for instance, of the fact that Mozart did his best work in 1791—before Watt had invented the steam engine, before Marconi had made wireless telegraphy possible, and before the Wright brothers had flown with a heavier-than-air machine. I'm inclined to think that Mozart was more important than any one of them, but that is by the way, and in all probability Mr. Payne or someone has considerably improved on his orchestration. There's so much noise nowadays that I doubt if any incipient Mozart would manage to produce anything worthwhile.

War Energy for Peace

When I think of all the selfless energy, courage and cleverness that have gone into the prosecution of this war, I wonder, with thousands of others, whether there is any reason at all why this same selfless effort can't be applied to the work of rebuilding and reorganising. It can, of course, provided there is the necessary incentive and financial support.

And the people who are temperamentally suited to the job of seeing that the effort is properly applied are, I'm quite sure, the world's flying people. Not necessarily those who actually fly, but those who are in any way connected with the business. I don't think I am deceiving myself when I say that pilots are less able to suffer fools gladly than any other race of men and women; their very job makes them see things far more clearly, relieved of all the tedious shibboleths which surround them.

The entire vocabulary of the flying man is steeped in the great and necessary work of de-bunking. At the moment there is a strong taint of cynicism in it all—but who wouldn't be cynical when surrounded by so much fantastic rubbish, dogma, and false thinking as there is in the world? Just look at the number of variations, invented for the most part by the pilots themselves, of that bit about the few who saved the many. It was a magnificent and quite true piece of oratory when the words were originally spoken, but the sentiment has been hopelessly overdone, and the R.A.F. laughs at it nowadays with that peculiar mixture of pride, cynicism and common sense which pervades the youngest Service.

Perhaps because they are engaged in the most modern of all industries and because, in order to get on with the war, they have so often to override the "Powers that Be," those engaged in any part of the aircraft industry are infected with the same excellent virus. Heaven knows there are lots of people in the business solely and simply for the purpose of making quick money—or as much as they can wangle past the eyes of the Commissioners of Inland Revenue—and there are lots of people who are knowingly failing to put in their very best, but the general rule seems to apply.

Lufthansa Bombers

Even before the war it was very noticeable that the people in the flying world came nearer to running on their own a little international federation than anybody else. I often wonder what our old friends in D.L.H. really thought when they were given the job of dropping bombs on the Warsaw, or the Rotterdam, or the London where they had spent so many happy times and met so very many pleasant people. Luckily, perhaps, not many of the German airline pilots and personnel were on the job—it was safer to send enthusiastic young men who had never been outside their own country and had been taught through years to believe that all other nations were unimportant and of baser metal. We shall never know. Most of the old gang are dead, and those who still survive will have been inculcated with the Nazi ideology.

Even so, they and their younger compatriots are probably nearer to seeing the light—or what the British and Allied people have for hundreds of years considered to be the light—than any others. The appearance of a certain measure of sportsmanship from time to time over such matters as rescue buoys and boats proves that the flying people, even of our hated enemy, are not beyond redemption.

As I've remarked before on this page, it will be a tragedy for us and for the world in general if the flying people are reduced to selling vacuum cleaners after the war. If they are, I shall be inclined to think that it is a deliberate policy amongst those who are afraid of the faint glimmer of real light which can be seen in the eyes of those who fly and those who make aircraft.

Just as it seems now to have so nearly destroyed it, aircraft can still save the world. Instead of sitting at home reading and writing faintly superior or actively rude diplomatic notes to one another, the rulers of the nations will have a chance of getting about quickly, and of seeing and talking to each other before any crossness or feeling of unfairness has set in for good. I've always been firmly of the opinion that if our old friends Adolf and Benito had been anything but the most essentially ignorant and parochially-minded humbugs, there would never have been a war. Adolf was afraid to go abroad in case his thin veneer of magnificence and intelligence should be cracked; Benito travelled within the Axis and strutted about in North Africa; maybe he was afraid that anywhere else his small stature and fantastic uniforms would not create quite the impression he wished.

Admittedly, master Ribbentrop provides an exception to such a suggestion. But he never had a very happy time, and put up so many arch-blacks in England that he must

THERE IS STILL THE FUTURE

have gone back with an overwhelming inferiority complex and a determination to show these people, who made him feel so small from time to time, a bit of what for. The Germans and their Dramatic Leader and their Air Fleet Blackening the Sky, and their Thunder of Armed Feet (or tank tracks), and their *Sieg Heils*—they are really almost as funny as the Blackshirts. Little children who should have been soundly smacked and sent to bed without their supper many, many years ago. Let us not lose out sense of humour over them. Naughty little boys sometimes pull the legs off living flies—until they have a bad dream in which the fly turns out to be bigger than they are.

Network of Air Services

Obviously, the very first thing to be done after this war is to organise a network of efficient air services throughout the world, so that the politicians, bless their simple little hearts, can talk themselves black in the face to people on whom their words may have an effect; so that the technicians can move around quickly in their work of re-equipping the world for planned production; so that manpower experts can organise the world's labour to best advantage; and so that the scientists, whether pure or practical-minded, can move about, giving and receiving the best and most reliable information.

For a start, at least, these airlines will be in the hands of the British, Americans, Russians and Chinese—each with their own prescribed area to cover. It is not too early now to make tentative plans for such a network, and R.A.F. Ferry Command, as well as all the American ferry pilots and B.O.A.C., are already pointing the way. As a preliminary piece of propaganda it might be interesting now if the M.O.I. could release some details of the number of Atlantic crossings made in any particular period—or, at least, of the number of trips made by the Ferry Command and other "taxi" Liberators, and such. I think the information would be enlightening to the professionally interested people and exciting to the general public.

Only by such rapid communication arrangements will it be possible to prevent a sort of Witches' Sabbath throughout the world, and, particularly in Europe, where the smoothies and the armchair killers simply must not be allowed to use hates and feelings to wreck the beginnings of a new and better Europe. Strangely enough the people who do the actual fighting and flying have never gone in much for this hate business. That has been left to their elders and betters.

Idealism? Of course. A very great deal of it will be needed if the human race is not to return to the caves and the tree-tops whence, presumably, it originally came to plunder and murder its way to a man-free millennium.

INDICATOR.

Aircraft for the Navy

Another Debate in the House of Lords

THE debate in the House of Lords on February 23rd added little new to the evergreen arguments about the Fleet Air Arm and its aircraft. Lord Chatfield moved the Motion and put the case for the Navy. Lord Brabazon was witty and amusing in his defence of the existing arrangement. Viscount Trenchard, Lord Keyes and Lord Mottistone said exactly what one would expect them to say.

Lord Templemore, replying for the Government, gave a very lucid explanation of the way in which aircraft are now ordered by the Admiralty, and as this was, to the best of our knowledge, the first time a full official statement on this subject has been made, we reproduce this part of Lord Templemore's speech verbatim. He said:—

"In May, 1940, a new Ministry, styled the Ministry of Aircraft Production, was set up and charged with the responsibility for research, experiment, design and production of aircraft and equipment, both for the Fleet Air Arm and for the Royal Air Force. So far as Fleet Air Arm aircraft and equipment are concerned the existing procedure is for detailed requirements to be drawn up by the Naval staff and to be communicated to the Ministry of Aircraft Production after approval by the Board of Admiralty. These requirements are prepared by officers who have had practical operational experience, and cover such matters as the functions of the aircraft, its limiting weights and dimensions, its armament, munition and equipment, and any special features which have to be incorporated, such as buoyancy arrangements, armour protection and so forth.

The Chief Naval Representative

"On the Council of the Ministry of Aircraft Production is a naval officer of Captain's rank who is styled Chief Naval Representative. He is a qualified pilot, and is responsible both to the Minister of Aircraft Production and to the Board of Admiralty for the oversight of the research, experiment, design, development and production carried out by the Ministry on behalf of the Admiralty. The Chief Naval Representative is assisted by a staff of naval officers comprising pilots and observers, as well as technical experts such as engineers, radio and gunnery officers. These naval officers work in the various Departments of the Ministry concerned with research, design, development, production, etc. They are responsible to the directors of the division in which they serve, but their activities are co-ordinated by and are under the general supervision of the Chief Naval Representative. This Naval organisation at the Ministry is also responsible for giving the Admiralty technical advice on the acceptance or rejection of designs, for arranging technical trials, for keeping contact with production, and advising the Admiralty on any anticipated difficulties and delays in obtaining deliveries. In addition to the Naval officers who serve at the headquarters of the Ministry, there are also other Naval officers who serve as overseers at the various factories engaged in the manufacture of naval aircraft and equipment.

Coastal Command

"So much for the administrative chain on the Fleet Air Arm side. As regards Coastal Command this is under the administrative control of the Royal Air Force, but is, for all operational purposes, under the control of the Admiralty which is exercised to the Air Officer Commanding-in-Chief Coastal Command. For Coastal Command aircraft the administrative chain is briefly as follows: The broad strategic requirements for building up the Air Forces used in co-operation with the Navy is drawn up by the Air Ministry in consultation with the Admiralty. Progress is watched and controlled (in common with other aspects of Air Force development) by a high level Committee on which all interested Departments are represented. Any disagreement, either as to the programme itself or as to the priorities afforded to the different components of it, would be reported to the appropriate Ministerial Committee. Detailed requirements of types and numbers of aircraft for maritime purposes are then drawn up by the Air Ministry and communicated to the Ministry of Aircraft Production who are responsible for meeting them to the best of their ability.

"The question of operational requirements, that is to say of specifying what speed, range, armament, etc., are expected of the new designs for R.A.F. aircraft—including general reconnaissance land planes, flying boats, torpedo bombers, etc.—is entrusted to a special division of the Staff under an Assistant Chief of the Air Staff who is responsible for maintaining close contact with the 'users' views. These operational requirements are, of course, drawn up in close consultation with the Commands responsible for operating the aircraft in question, and particularly with Coastal Command. There is in addition a joint Admiralty-Coastal Command Committee to keep under review such matters as numbers, types, and equipment of aircraft, types of weapons, requirements for effective reconnaissance and methods of perfecting attacks on ships as well, of course, as a whole variety of problems which are not relevant to the present Motion."

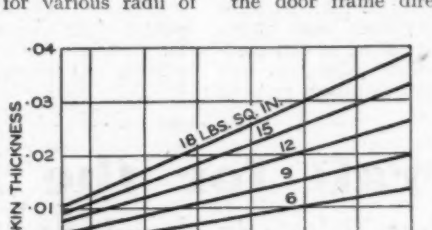
High-altitude Flight

Part III—Shell Design of the Cabin : The Pressure Regulating Valve and Supercharger Control Unit

By W. NICHOLS, A.R.Ae.S.

IN the previous articles many of the problems connected with high-altitude flight, both from commercial and military considerations came under review. The observations on pressure cabin design are herein continued.

LOADS on the cabin skin due to pressurisation have certain peculiarities which distinguish them from flight or landing loads. The magnitude of the imposed loads will be known fairly accurately, and providing suitable safety valves are fitted, they cannot be appreciably exceeded. The accompanying graph shows approximately the required thickness of the skin for various radii of curvature, and, in addition, various design pressure differentials.



Skin thicknesses corresponding to 56,000 lb. per sq. in. ultimate strength. Rivet seam efficiency assumed 75 per cent. for various design pressure differentials.

An inherent feature of pressurisation is a demand for considerable refinement of the skin joints, and provision for sealing the joints imposes limits on the rivet spacing and patterns to be used. If the loads to be transmitted by the seam are relatively large, it is generally necessary to resort to multiple-row spacing to ensure a high-efficiency joint. It has been found that the most efficient method is to place the rows relatively close together. By this arrangement difference of stretch between the skin panels is reduced to a minimum, and unit loading in the outermost rivets is not appreciably higher than the average for the entire pattern.

In the sketch are shown four typical joints. The two- and three-row spacing as at (a) and (b) are usually critical in shear, or the skin is critical in bearing; thus the strength can be calculated closely. With the four-row spacing, as at (c), the joint will develop about 75 per cent. of the nett sheet strength in tension unless gauges are sufficiently high to cause shear failure of the rivets.

The spacing at (d) compares well with the four-row pattern, and on account of the greater "pitch" in each row it is a better arrangement where intersections with other joints may occur. To obtain higher efficiencies requires still further complexity of pattern, rapidly departing from the practical.

Sealing Skin Joints

American practice is to seal the joint with 1/64in. thick special tape inserted between the laps, a double-row of rivets diagonally spaced at approximately ⅛in. pitch being used for the normal skin seams.

An opening in a cylindrical shell, if extending to an appreciable arc, presents two problems of a different nature. The more simple of the two is that of carrying the circumferential loads. The loads considered as being interrupted by the opening will be carried as tension in the ring and skin elements immediately forward and rearward of the opening. Beam structures above and below must, therefore, be provided to effect this redistribution of load. For most normal doorways these members are of moderate size and present no great difficulty in design.

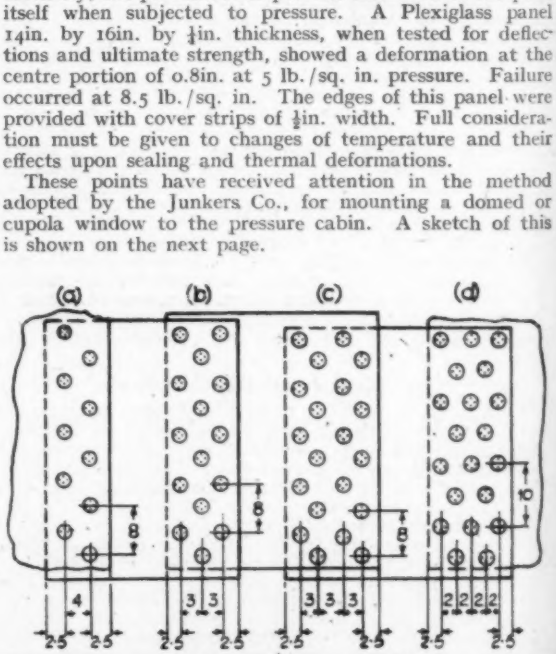
The inward force of the ring and skin due to tension is offset by the outward force on the door, and this must be transmitted to the rings through support flanges, latches, or other suitable means, which require to be freely distributed along the sides.

The second and more difficult problem is that due to distribution of the longitudinal loads around a doorway. Material at the top and bottom of the opening must be supplemented to replace that cut away, and it must be extended sufficiently far fore-and-aft of the opening to redistribute the loads without setting up unduly large local stresses. The door itself can be made a relatively simple panel carrying loads as a beam simply supported at its front and rear edges.

A door that opens inwardly will require but a simple latching mechanism, since pressure loads are carried by the door frame directly, but this arrangement is not always convenient in service. Furthermore, the substitution of sliding doors reduces considerably the advantages of the former type. If the doors are arranged opening outwards they will require a considerable number of latches sufficiently strong and reliable to carry the pressure loads. On the Boeing Stratoliner the main entry door, all hatches, and emergency exits for passengers and crew, open inwardly for the reason stated above.

In the design of window frames, if glass is to be used, it is important to avoid high stresses which might warp the frames. With transparent plastic materials, due to their inherent low modulus of elasticity, the problem is to prevent distortion of the pane itself when subjected to pressure. A Plexiglass panel 14in. by 16in. by ¼in. thickness, when tested for deflections and ultimate strength, showed a deformation at the centre portion of 0.8in. at 5 lb./sq. in. pressure. Failure occurred at 8.5 lb./sq. in. The edges of this panel were provided with cover strips of ¼in. width. Full consideration must be given to changes of temperature and their effects upon sealing and thermal deformations.

These points have received attention in the method adopted by the Junkers Co., for mounting a domed or cupola window to the pressure cabin. A sketch of this is shown on the next page.



Rivet patterns (in terms of diameters). Examples covering reasonable range of joint efficiencies.

HIGH-ALTITUDE FLIGHT

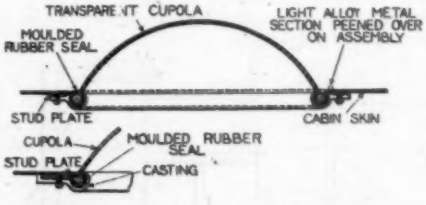
The cupola, of moulded Perspex or a similar plastic material, is provided in the manufacturing process with a bulbous rim. Secured to the cabin skin by a stud plate is a metal section equipped with a rubber insert to form a seal, which accommodates the rim of the cupola on assembly. The outer flange of the metal section is then "peened" over to secure the cupola in position.

An alternative and better scheme shown in the sketch makes use of a casting in place of the metal section. In both cases, however, the rubber seal allows for the expansion of the plastic material due to temperature changes. The member holding down the cupola is operative mainly from the inner side.

Avoiding Bolt Holes

By this method bolt holes, which would necessarily have to be drilled oversize to allow for expansion and contraction of the plastic material, are dispensed with, thus obviating this source of leakage. Apart from a cupola window this method of fixing could be applied to flat plastic panes with equal advantage.

A transparent unit for a pressure cabin by the Henschel Company is interesting, due to the claim that the unit forms a structural unit in addition. Its adaptability would appear to be best utilised in military aircraft. The arrangement consists of a number of flat plates provided with windows forming a transparent double wall or skin. The units are similar and may be of hexagonal shape. The structural unit thus formed is somewhat similar in principle to a double-walled geodetic structure, and it certainly lends itself admirably where a transparent section of the cabin with complex curvature becomes necessary, such as in the nose of a military aircraft as shown in the illustration on the next page.



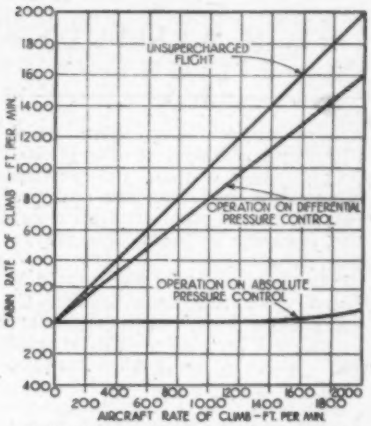
The Junkers cupola plastic window mounting with bulbous rim and rubber seal.

The provision of a windscreen or window of double thickness is not unusual in pressure cabin design, and apart from added strength it also permits of warm air being delivered to the space between the panels, thus preventing frosting and icing of the windscreen.

As an indication of the thickness of the glass or plastic used, a pressure cabin windscreen for a transport aircraft is stated to be composed of the following: six panes of laminated glass, $\frac{3}{16}$in. thickness (outer); eight panes of Plexiglass, $\frac{3}{8}$in. thickness (comprising inner and side panes). Passengers' windows in this cabin were also Plexiglass, $\frac{1}{4}$in. thickness.

Doors can be conveniently sealed by any method that takes account of the special problems involved. Neither door nor frame can be considered to be especially rigid. The sealing means must therefore accommodate itself to appreciable relative movement between them. Approximate tightness can be accomplished by means of a flexible rubber flange attached to the edge of the door with its free edge resting on the door frame. The cabin pressure will force this seal tightly against the frame.

It appears that the inflation of a tubular seal, such as that now to be described, is a better method, though the Boeing Stratoliner doors are sealed by a gasket under the influence of cabin pressure. The method is the inflation of a rubber tube to fill out and seal the space between door and frame, the de-icer pumps furnishing the pressure.


UNSUPERCHARGED FLIGHT
OPERATION ON DIFFERENTIAL PRESSURE CONTROL
OPERATION ON ABSOLUTE PRESSURE CONTROL
CABIN RATE OF CLIMB - FT. PER MIN.
AIRCRAFT RATE OF CLIMB - FT. PER MIN.

Reduction in rate of pressure change in supercharged cabin during various rates of climb.

A British invention by the Dunlop Rubber Co., Ltd., also provides for a seal involving the inflation of a rubber tube. Hitherto a common defect of the inflated tube used as a seal has been the absence of an automatic means for modifying the pressure in the seal to suit the external atmospheric pressure changes, and in consequence there is a risk of either over-inflation or under-inflation. The Dunlop Co. claim to have overcome this defect by ensuring a constant excess of pressure in the sealing members above that of the outside atmosphere. A diagrammatic arrangement of the apparatus which provides for this is shown on p. 238. Pressure is exerted and maintained pneumatically.

The Dunlop Seal

From the sketch it will be seen that the sealing tube "A" is positioned within a suitable casing "B," serving as an abutment on distension of the tube. Cylinder "C" contains a piston "D," one face of which transmits the pressure to the seal, the other face being subjected to the external atmosphere, and also an additional predetermined constant pressure. This constant pressure is transmitted to the piston by a rod connecting with a second piston "E" displaceable in the cylinder "F." The two cylinders are insulated and sealed by a gasket through which the connecting rod is suitably guided.

Cylinder "F" is connected to a source of reduced pressure, the engine induction manifold, via a three-way valve "V," the opposite end being subjected to the cabin pressure. Briefly, a constant excess of pressure in the sealing members over that of the atmosphere outside the cabin, independent of altitude, becomes automatic, due to the opposing forces which act upon the face of the pistons thereby placing them in equilibrium.

When the cabin has been designed to withstand the desired internal pressures and sealed to prevent excessive leakage, it will require certain additional safely precautions.

Height.		Pressure.		Density.		Temperature.		Speed of Sound.		Normal Aspirated Engine.	Correction to A.S.I.
Feet.	Metres.	lb./sq. in.	Millibars.	lb./cu. ft.	Grm./cu. metre.	Deg. F.	Deg. C.	M.P.H.	Ft./Sec.	H.P.	Multiply by
55,000	16,780	1.31	.91	0.009	147	70	56.5	660	971	78	2.892
50,000	15,240	1.68	116	0.011	184	70	56.5	660	971	100	2.567
45,000	13,720	2.14	147	0.015	233	70	56.5	660	971	135	2.275
40,000	12,190	2.72	187	0.019	307	70	56.5	660	971	170	2.023
35,000	10,660	3.46	238	0.024	381	67	54.3	661	973	225	1.800
30,000	9,144	4.37	301	0.029	460	49	44.4	677	997	280	1.634
25,000	7,620	5.46	376	0.034	552	31	34.5	693	1,013	360	1.494
20,000	6,096	6.77	465	0.041	656	13	24.6	707	1,035	454	1.369
15,000	4,572	8.31	572	0.048	774	+ 5	14.7	723	1,058	567	1.261
10,000	3,048	10.08	697	0.056	908	+23	4.8	739	1,081	693	1.164
5,000	1,524	12.23	843	0.066	1,055	+41	+ 5.1	755	1,105	838	1.077
0	0	14.69	1,019	0.077	1,226	+59	+15.0	771	1,128	1,000	1.000

The effect of altitude upon various properties which influence the performance of an aircraft.

HIGH-ALTITUDE FLIGHT

A pressure-regulating valve which will permit maintenance of an internal pressure higher than the external atmospheric pressure, and still provide for an adequate ventilation flow and discharge by-products of respiration, is essential.

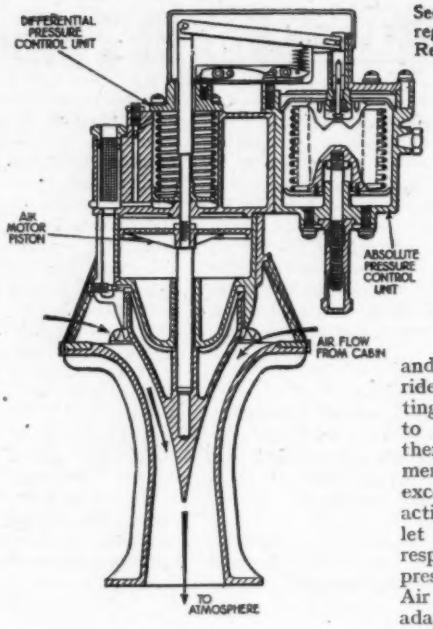
The design of this unit should be based upon two main factors, the comfort and health of passengers and crew, and secondly, the simplest mechanism to meet these requirements.

One of the latest types of pressure-regulating valve is of British design, and has been adopted in this country and America on pressure cabins with marked success. Unfortunately, details cannot be given at the moment, but as a matter of technical interest an efficient valve of American origin is included among the illustrations. This unit is divided into three major component parts, so interconnected as to correlate their respective functions. The primary part is the valve which restricts the cabin outlet. It is actuated by an air motor piston or diaphragm. The movement of this part is controlled by the two secondary parts, referred to as the absolute and differential pressure regulators in accordance with the nature of regulation each performs.

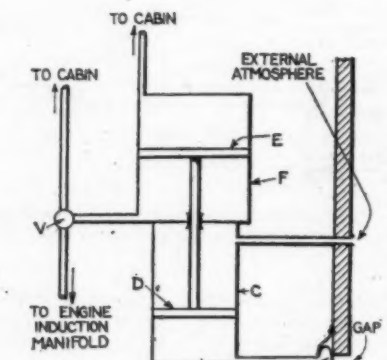
Pressure Control

The absolute pressure control comprises an evacuated sylphon which actuates a metering pin to regulate air pressure above and below the diaphragm. The differential pressure control consists of a piston and spring which actuate a collared shaft. The outlet valve controls the pressure in the cabin, and at the same time gives a constant ventilating flow. It is entirely self-contained and automatic in action.

Operation of the unit can be divided into three phases: (1) operation up to the desired pressuring altitude, during which the valve is held in full-open position for maximum ventilating flow; (2) this phase begins when the evacuated sylphon has expanded sufficiently to meter the flow from the top of the actuating diaphragm, thereby regulating the position of the outlet valve; phase (3) starts when the design pressure differential of the cabin has been reached, and the differential piston overrides the absolute control, permitting the upper side of the diaphragm to be vented to the atmosphere, thereby producing an opening movement of the outlet valve and relieving excess cabin pressure. Through the action of a follow-up system, the outlet valve closure becomes instantly responsive to slight changes of cabin pressure. This unit, produced by The Air Research Manufacturing Co., is adaptable to either military or commercial application.



Section through the cabin pressure-regulating valve, produced by Air Research Manufacturing Co., U.S.A.

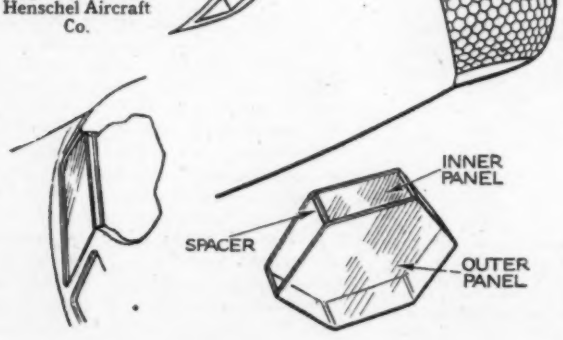


The Dunlop automatic means for modifying pressure in sealing tubes to suit external atmospheric pressure.

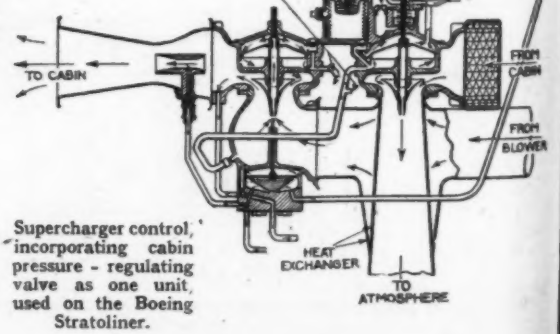
Boeing System

On the Boeing Stratoliner the cabin pressure-regulating valve is combined with the supercharger flow-control valve into a single compact unit to conserve weight and simplify installation. This type of installation, of which a sketch is shown, offered an excellent solution to the problem of defrosting the outlet diffuser in that the junction of the two ducts could be made in the form of a heat exchanger, the warm incoming air being passed around the outlet diffuser.

Control of the supercharger flow is entirely automatic, and is operated by the forces it regulates. Regulation is by means of a poppet valve, which offers a restriction to the flow of air from the blower of the amount necessary to limit the flow to a predetermined rate. The pressure drop across the valve produces forces in an upward direction. These forces are balanced by opposing forces sup-



Double-walled transparent unit, proposed by the Henschel Aircraft Co.



Supercharger control, incorporating cabin pressure-regulating valve as one unit, used on the Boeing Stratoliner.

plied by the difference in pressure between the blower discharge duct and the cabin, and acting downward upon an air-motor piston attached to the valve stem. The upper side of this piston is vented to blower pressure through a port in the valve stem, control being accomplished by metering the flow of air through this port.

The differential pressure between the inlet and the throat of a venturi located in the duct system is transmitted to the upper and lower sides of a flow piston in such a manner as to produce a downward-acting force, this force being balanced by a spring. A metering pin attached to the flow piston is so located that its motion opens or closes the port connecting the upper side of the air motor piston to blower pressure. Any change in the pressure balance acting on the valve and piston assembly results in a change in the position of the valve.

It will be apparent, therefore, that an increase in the flow of air through the venturi will cause the flow piston and metering pin to move downwards, opening the port to the upper side of the air-motor piston, with the result that the valve will follow the motion of the metering pin and restrict the flow of air entering the cabin. For any decrease in flow, the reverse action will take place. Actually, the forces acting as described will reach a balance with the force of the flow spring, thereby maintaining a constant rate of flow to the cabin.

Apart from the structural design of the cabin, etc., numerous other problems remain for discussion. Specifying the size, type and operating characteristics of the cabin superchargers and to analyse the merits of the various types available with drive and control devices, etc., would alone occupy many more valuable pages of *Flight*.

In conclusion, the writer wishes to acknowledge, with many thanks, the assistance rendered by R.T.P.3, Ministry of Aircraft Production, in making certain technical abstracts and translations available for examination.

R.A.F. and U.S. Fighter Pilots

Brave Men Decorated : A Mutual Ceremony

A VERY pleasant ceremony was held on Thursday last at a fighter station somewhere in England which has been placed at the disposal of a Fighter Group of the U.S. Army Eighth Air Force. It was conducted by General F. O'D. Hunter, Commanding the Fighter Command of that Force, and by Air Marshal Sir Trafford Leigh-Mallory, K.C.B., D.S.O., A.O.C.-in-C., Fighter Command, R.A.F.

The American squadrons, with band, were drawn up on the parade ground when the General and Air Marshal arrived, and in front of the parade stood a line of pilots who were to receive decorations. One was in Air Force blue; the rest in the khaki of the U.S. Army. The R.A.F. officer was Wing Commander R. M. B. Duke-Wooley, D.S.O., D.F.C. and bar, who had been loaned to the American Air Force and had led this particular Fighter Group for over two months. He was decorated by General Hunter with the American Distinguished Flying Cross, which seems to rank somewhat higher than the British D.F.C. It is a very handsome decoration and the gallant Wing Commander must be proud to have won it.

Then seven U.S. officers were decorated by the General with the ribbon of the Air Medal, a distinction which does not rank so high as the D.F.C. The actual medals will be issued afterwards. An eighth award was announced to an officer who is missing. Oak Leaf Clusters (corresponding to bars on a British decoration) were also handed to four other officers. One, Major Coen, who already possessed one cluster, was given three more. These little badges are to be sewn on to the ribbon, but that could hardly be done on parade, so they were simply handed to the recipients.

Air Marshal Sir T. Leigh-Mallory then handed to a selected officer a box containing 60 specially struck silver medallions for American pilots and enlisted men who had formerly been volunteers in the R.A.F., and he made a speech specially thanking the Eagle Squadrons for the part they had played in helping the R.A.F.

He was followed by General Hunter, who said that there was no doubt that the recipients of those medallions would keep them as among their most treasured possessions for the rest of their lives. General Hunter is a fine-looking man, every inch a soldier, as the saying is, who fought in the last war, was officially credited with nine enemy aircraft shot down, was wounded in action (for which Americans receive a decoration called the Purple Heart), and was awarded the American D.F.C. with four Oak Leaf Clusters, and the French Croix de Guerre with Palm. He spoke of what it had meant to him to receive into his Command this Group of fully trained operational pilots. Their experience, through the marvellous training and direction they had received from the R.A.F., had meant an untold amount to the Eighth Air Force. The co-operation between that Air Force and the R.A.F. was a thing which had never been known in war before. He ended, raising his voice and speaking in a most impressive manner: "Shoulder to shoulder, side by side, wing-tip to wing-tip, we are steadily mounting in our assault, until we finally annihilate the Hun's *Luftwaffe*. We are going to annihilate them."

Book Review

Malayan Postscript. By Ian Morrison. Faber and Faber, Ltd. 8s. 6d.

MR. MORRISON was correspondent for *The Times* during the Japanese invasion of Malaya, and many of his opinions are familiar to readers of that paper. His generalisations about British colonial administration should not be taken as coming from an authority on the subject. Mr. Morrison knows Japan and the Japanese better than he knows British Colonies.

Flight, however, is chiefly interested in what he has to say about the air side of the campaign. Again, he is not an expert, but he collected information from those who were better informed. He gives a list of the types used by the enemy, and describes their methods of bombing. On pages 91-92 he writes: "The quality of the Japanese Navy O was as much a surprise as was the poor quality of the American-built Brewster Buffalo, when the two were finally pitted against each other. The Buffaloes, which were the only fighter aircraft in Singapore for the first month of the war, turned out to be far slower than the Navy O's, less manœuvrable, less efficiently armed. They were a bitter disappointment. . . . The Hurricanes, which first took the air about the middle of January, arrived too late and in insufficient quantities." In the early stages of the campaign, Mr. Morrison says that "we had not learned how to disperse our bombers into runways in the jungle."

He mentions the use made by the Japanese of dive-bombers, and the complaints of our soldiers that they got no fighter protection against them. It is a familiar complaint. He does not say whether the dive-bombers did much damage, or whether our soldiers found, as they have in other campaigns, that the moral effect of dive-bombing is much greater than the material damage wrought by it.

It is a very interesting book, but the author does not seem to have extracted any military lesson from the campaign. On the whole, it seems safer to fall back on the words of Field-Marshal Smuts, that after Vichy had given up Indo-China to the Japanese, the fall of Malaya and Singapore was the inevitable consequence.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

THE BEST TYPES OF AIRCRAFT

An Attempt to Rank Leading Designs

IN sporting circles it is the practice to rank leading exponents of a particular sport. Among students of aircraft design and performance quite a regular topic of discussion is which country leads in any particular class. With the present vogue of designing aircraft for specialised duties, such a list tends to become long, so that instead of an order of merit, I have made an attempt to list the best in each of the recognised classes of the world.

Argument and discussion are the rule when any such list is put forward, and advocates naturally have their own particular fanciers from the point of view of practicability, responsiveness and manœuvrability or maximum performance. Six months ago the list would have been very different; in another six months one imagines it will need further major change. What do your readers think of my selections; which includes 9 British, 7 American and 2 German productions?

Ex-R.F.C.

OPERATIONAL CLASS	AIRCRAFT TYPE	NATIONALITY
Single-seater Fighter	Spitfire V	British
Interceptor	Hawker Typhoon	British
High-altitude Fighter	Spitfire IX	British
Long-range Day and Night Fighter	Bristol Beaufighter	British
All-purpose Fighter/Bomber	Hurricane	British
Long-range Fighter/Bomber	Ju 88	German
Long-range Light Reconnaissance Bomber	Mosquito	British
Medium Bomber	B.25 Mitchell	U.S.A.
Heavy Bomber	Avro-Lancaster	British
High-altitude Bomber Reconnaissance	Ju 86 P	German
Army Co-operation (low level)	N.A. Mustang	U.S.A.
Naval Fighter	Vought Sikorsky Corsair	U.S.A.
Land-based Torpedo Bomber	Handley Page Hampden	British
Naval Torpedo Bomber	Barracuda	British
Naval Dive Bomber	Dauntless	U.S.A.
Long-range Naval Patrol	Consolidated Catalina	U.S.A.
Transport Landplane	C.47 Skytrain	U.S.A.
Transport Flying Boat	314A Boeing Clipper	U.S.A.

ENGINE RELIABILITY

Fine Record of R.A.F.'s Cheetahs

WE have noticed in the issue of *Flight* dated January 14th an article headed "Gipsy's 1,260 Hours."

In this connection we feel that the following items, which relate to the Cheetah engine, will be of interest to you.

The official overhaul period for the Cheetah engine ever since November, 1941, has been 1,200 hours. In October, 1941, a Cheetah X engine, after carrying out 1,080 hours' normal service in the R.A.F., was subjected to, with only minor adjustments, a full Air Ministry 100 hours type test, which it passed very satisfactorily.

We have just heard that in Canada the official overhaul period for the Cheetah IX engine has been approved at 1,400 hours between overhauls. We frequently receive engines from the Service for repair which have carried out periods in excess of 1,260 hours, and have recently repaired a series of 25 engines the average life of which was 1,249 hours.

The Cheetah X, originally rated at 6,750ft., is now approved, as is also the Cheetah IX, for a full throttle take-off on 87 octane fuel. The Cheetah X maximum rated take-off is 420 b.h.p. The maximum climb, level and cruising figures being increased proportionately.

As you are no doubt aware, the Cheetah has been and is being used in very large numbers in the R.A.F. and Empire Training Schemes apart from its other services, and the numbers at present in service and the fact that they are operated all over the Empire in quantity and under extreme variations of climatic conditions, we feel, bears testimony to its soundness of design and workmanship.

The types of service under which the Cheetah operates are not in any way as spectacular as some of the larger types, but we do feel justified in claiming that the Cheetah has been one of the mainstays of the R.A.F. in its production of trained crews.

C. S. EMERY,
Manager (Contracts Dept.), Armstrong Siddeley Motors, Ltd.

FIGHTER SPEEDS

Spitfire and the S.6B Not Comparable

MR. C. G. WILLEY questions the fact that any advance in aircraft has been made in the last twelve years. To support his claim he states that while the Supermarine S.6B of 1931 flew at 407.5 m.p.h., aircraft which can attain such speeds are only just coming into service in the shape of the Typhoon.

The most obviously questionable point is that aircraft development should be judged solely by the highest attainable speed. Even granting that this is a good criterion of advancement, it is impossible to compare the present Spitfire with the S.6B. The S.6B in the form in which it broke the world speed record was practically a flying aircraft-engine; it consisted of an engine built to develop 2,600 h.p. for a short time and with as little as possible in the way of wings, empennage, etc.

To compare such an aircraft with a typical fighter of to-day such as the Spitfire IX is futile. The Spitfire IX has to carry sufficient fuel for at least two hours' duration, ammunition for two cannon, armour, and many more instruments than the S.6B, and in addition must be able to carry out the most difficult and strenuous aerobatics, withstand considerable damage, and still fly home safely. If all these factors were imposed on the S.6B I fear that it would not put up much of a performance even with its gigantic engine. Mr. Willey also asks why an engine of only 1,030 h.p. was fitted to the Spitfire (I presume he refers to the Spitfire I). The rather obvious reason is that at the time that the Spitfire I was produced (1936), the Merlin II was the highest-powered engine available.

The only way of comparing aircraft speeds then and now would be to build a racing aircraft which, I am confident, would attain a speed of at least 500 m.p.h. If, on the other hand, Mr. Willey wishes to compare *fighter* speeds he will see that great advances have been made.

M. W. BERNER.

Short Sprint versus Long Duration

IN the February 4th issue of *Flight*, C. G. Willey, Esq., wished to know what prevented the fighter of to-day from passing the 407.5 m.p.h. of the S.6B.

He mentioned the Rolls-Royce "R" of 2,600 h.p., and compares it with the 1,030 h.p. of the Merlin; but the "R" was a sprint engine, developing a terrific h.p. for only a short time; in fact, it was only guaranteed to run at maximum power for a few minutes by its makers. The Merlin, although only developing 1,030 h.p., can keep it up for hours on end, even to the extent of carrying bombers to Italy and back.

The fuselage of the S.6B is, of course, much smaller than the Spitfire and produces far less drag, for the latter aircraft carries far more elaborate equipment, such as radio, oxygen, fuel tanks, additional instruments, controls for guns, undercarriage, etc. The S.6B had only a bare minimum of fuel which was carried in the floats.

The wings of the Spitfire are much thicker, due to the space needed for the retracting undercarriage, guns and ammunition, and are of much larger wing area, for the simple reason that they have a far greater weight to lift. In addition, the fighter is built to stand up to violent aerobatics, combined with the effects of cannon and machine-gun fire; this all takes up space and weight.

In fact, it is like asking why the 1 mile runner does not do the same speed as the 100 yards sprinter.

P. L. NIGHTINGALE, R.A.F.V.R.

Many Others, Too

MANY more replies to Mr. Willey's letter have been received, but considerations of space forbids their inclusion. But like the above selection, they all point out the great differences between a special racing aircraft, such as the S.6B, and a Service fighter, in which speed is but one of a number of vital considerations.—ED.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News and Announcements

The Duke of Gloucester watching airborne troops emplaning in an Airspeed Horsa glider.

Mongoose Crest for Baroda Squadron

A MONGOOSE—noted for its agility and ferocity—is the emblem on the crest which was presented to the Baroda Spitfire squadron of Fighter Command by Air Vice-Marshal H. W. L. Saunders, C.B.E., M.C., D.F.C. and Bar, M.M., Air Officer commanding a fighter group in the south of England. The motto underneath the crest is "Danger is our opportunity."

Appointments

RECENTLY promoted from the rank of Air Comdre., Air Vice-Marshal H. Broadhurst is now to command the Western Desert Allied Air Forces in succession to Air Vice-Marshal Conningham, who is to concert air operations under Air Chief Marshal Tedder in Tunisia.

Air Vice-Marshal Broadhurst, who holds the D.S.O. with bar and D.F.C. with bar, is 37 years of age, and the youngest Air Vice-Marshal in the R.A.F. As a fighter pilot he has over 600 operational hours and at least 12 enemy fighters to his credit.

THE RT. HON. W. Y. DARLING, C.B.E., M.C., D.L., J.P., has been appointed hon. Air Comdre. of No. 603 Sqn.

Awards

Fleet Air Arm

THE KING has been graciously pleased to approve the following awards:—

For bravery and resource during operations in Madagascar:—

MENTION IN DESPATCHES.

Lt. (A) G. H. CREESE, R.N.
Temp. Sub. Lt. (A) E. F. L. MONTGOMERY, R.N.V.R.
Flt. Sgt. B. J. BROOKS, B.E.M., R.A.F.
Flt. Sgt. J. A. STRACHAN, R.A.F.
Ldg. Air Fitter (E) L. F. COOK.

Royal Air Force

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy:—

DISTINGUISHED SERVICE ORDER

Grp. Capt. G. L. CARTER, A.F.C.—This officer has commanded the fighter force in the Western Desert with conspicuous success. Despite the magnitude of his task, Grp. Capt. Carter has flown on numerous sorties.

Act. Wing Cdr. J. K. BUCHANAN, D.F.C., No. 272 Sqn.—This officer has participated in a very large number of sorties, involving bombing attacks against many countries occupied by the enemy. He arrived in Malta in November, 1942, and within the next fourteen days led his squadron in six bombing attacks on enemy shipping. During these operations, Wing Cdr. Buchanan destroyed six enemy aircraft in combat.

Act. Wing Cdr. E. H. THOMAS, D.F.C.—Since being awarded a Bar to the D.F.C., this officer has led his wing on numerous sorties over enemy territory, in which thirteen enemy aircraft have been destroyed, one of them by Wing Cdr. Thomas.

Wing Cdr. A. F. ANDERSON, D.F.C, No. 268 Sqn.—Wing Cdr. Anderson has been in command of No. 268 Sqn. since December, 1940. He has throughout displayed the greatest initiative in arranging for his squadron to participate in offensive operations, and has always led the first of any new type of sortie. He has been the leader in several operations over Holland and in many shipping reconnaissance sorties.

Group Capt. G. L. Carter, A.F.C., who has been awarded the D.S.O. He commanded the fighter force in the Western Desert. The official citation appears on this page.

Wing Cdr. R. E. RIDGWAY, No. 40 Sqn.—This officer has had an exceptionally long and varied flying career, during which he has participated in numerous operational flights in many different theatres of war. From Malta his squadron has been extremely successful in operations against enemy ports, airfields and installations in Sicily and Tunisia, and has given material assistance to the Army.

Act. Sqn. Ldr. P. C. B. WARNER, R.A.F.V.R., No. 462 Sqn.—Since January, 1942, this officer has taken part in a large number of operational flights, both in Europe and the Middle East. During an attack on Krupps' works at Essen in June, 1942, his aircraft was caught in a cone of searchlights and severely damaged by anti-aircraft fire. By skilful airmanship Sqn. Ldr. Warner regained control and flew his crippled bomber safely back to base, avoiding a combat with a night fighter en route. Again in October, 1942, when over an airfield in Crete, his aircraft was hit by fire from the ground defences, wounding his navigator, causing both outboard engines to stop and all electrical systems and many instruments to fail. With a handicap of 1,500lb. of bombs in the wings, he flew the aircraft safely back to base, making a successful landing in the dark.

Wing Cdr. I. H. S. RUSHER, No. 162 Sqn.—Wing Cdr. Rusher has participated in forty sorties, many of them of a hazardous nature. During the battle at El Alamein he flew with great distinction. On another occasion, although engaged on a special mission, he bombed an airfield in Crete, destroying five aircraft on the ground.

Act. Wing Cdr. J. C. SCOTT, R.C.A.F., No. 413 (R.C.A.F.) Sqn.—This officer has completed a very large number of operational missions, involving arduous flights over the Atlantic, Arctic and Indian oceans and the Mediterranean. During a flight in December, 1942, his aircraft became defective and he was forced to return to base. Within a quarter of an hour he took off in another aircraft. After locating his objective he flew over the area for more than an hour to secure information.

Act. Wing Cdr. C. M. WIGHT-BOYCOTT, No. 29 Sqn.—Since July, 1941, Wing Cdr. Wight-Boycott has completed much operational flying by night. He was appointed to command his squadron in September, 1942. In January, 1943, during an enemy air attack, he displayed outstanding skill and keenness and destroyed four enemy aircraft.

BAR TO DISTINGUISHED FLYING CROSS

Act. Wing Cdr. S. B. GRANT, D.F.C.—In December, 1942, this officer flew the leading aircraft of a formation acting as escort to a force of fighter bombers. During the flight, 63 enemy air transports escorted by five twin-engined fighters were intercepted. Leaving the fighter bombers to attack the transports, Wing Cdr. Grant led his formation in an attack on the enemy fighters, all of which were shot down. This officer, who displayed great dash, destroyed two of them.

Act. Flt Lt E. L. IFOULD, D.F.C., R.A.A.F.

No. 109 Sqn.—One night in January, 1943, Flt. Lt. Ifould and Sqn. Ldr. Bufton were navigator and captain respectively of an aircraft detailed to lead a bombing force against a target in the Ruhr. Precise timing was essential and these officers, displaying skill of the highest order, achieved their purpose exactly as planned. The following night, Flt. Lt. Ifould and Sqn. Ldr. Bufton faultlessly completed another sortie in similar circumstances.

Sqn. Ldr. J. H. WEDGWOOD, D.F.C., No. 92 Sqn. (since deceased).—Since being awarded the D.F.C. this officer has destroyed a further four enemy aircraft, bringing his total victories to thirteen. He has displayed great coolness and determination in his attacks against the enemy, and has continued to lead his squadron with skill and courage.

Act. Sqn. Ldr. A. W. BARR, D.F.C., R.A.A.F., No. 3 (R.A.A.F.), Sqn.—Since being awarded the D.F.C. Sqn. Ldr. Barr has destroyed a further four enemy aircraft. In the absence of his C.O. in May, 1942, he assumed command of the squadron, and continued to lead it with courage and distinction during the critical period of the German advance. On one day alone he flew on six fighter-bomber sorties, and on another occasion he force-landed during an operation, but after overhauling his aircraft and preparing a runway, managed to fly back a few minutes ahead of the enemy. Some days later a formation led by him was attacked by enemy aircraft. In an effort to save one of his pilots from an attacking aircraft he was himself shot down. This experience in no way diminished Sqn. Ldr. Barr's zeal to engage the enemy.

DISTINGUISHED FLYING CROSS

Sqn. Ldr. H. E. BUFTON, A.F.C., No. 109 Sqn. —For citation see Flt. Lt. IFOULD, D.F.C.

Act. Flt. Lt. R. SEED, R.A.F.V.R., No. 249 Sqn. —This officer has participated in a large number of sorties, including many fighter bomber operations. One morning in November, 1942, he destroyed a Me 109 off the coast of Sicily. During the afternoon he bombed the airfield at Gela, obtaining hits on a hangar. The next day, despite heavy opposing fire, he successfully attacked Comiso airfield. Flt. Lt. Seed has made many low flying attacks on airfields and has destroyed at least four enemy aircraft on the ground.

F/O. K. C. BEETON, R.A.A.F., No. 10 (R.A.A.F.) Sqn. and F/O. R. G. BOWLEY, R.A.A.F., No. 10 (R.A.A.F.) Sqn.—In January, 1943, F/Os Beeton and Bowley were captain and navigator of a Sunderland aircraft which located an enemy merchant ship attempting to evade the blockade. Despite extremely adverse weather, F/O. Beeton displayed outstanding determination and maintained patrol over the area until one of our naval vessels arrived and engaged the enemy vessel. On reaching a base in this country, F/O. Beeton effected a masterly emergency landing in very difficult circumstances. Throughout F/O. Bowley displayed brilliant navigation which contributed materially to the success of the operation.

F/O. A. HODGSON, R.A.F.V.R., No. 502 Sqn.—In January, 1943, this officer captained an aircraft detailed for a shipping reconnaissance. In spite of extremely adverse weather he succeeded in locating an enemy merchant ship attempting to run the blockade. He made several attacking runs over the ship, but visibility was so poor that he was unable to complete his attack. Nevertheless, he flew over the objective for an hour and a quarter, shadowing it most effectively. He eventually landed his aircraft at base with fuel sufficient for only a further 15 minutes' flying.

F/O. A. W. R. TRIGGS, M.B.E., R.A.A.F., No. 172 Sqn., and P/O. C. BADHAM, R.A.A.F., No. 172 Sqn.—One night in October, 1942, F/O. Trigg and P/O. Badham were pilot and navigator respectively of an aircraft which attacked successfully a U-boat in the Bay of Biscay. In the same area, one night in January, 1943, they again executed a determined attack, in bad weather, on another enemy submarine. A few nights later, F/O. Trigg displayed fine airmanship when, during an anti-submarine patrol, a propeller and reduction gear broke adrift and caused the entire engine to fall into the sea. Despite this, he flew the aircraft back to this country and landed it safely.

P/O. A. F. FOSTER, R.A.F.V.R., No. 161 Sqn. —This officer has completed numerous sorties and has acted as captain of aircraft on 30 occasions. He has at all times displayed exceptional determination and initiative. This was amply demonstrated one night in December, 1942, when he completed an important sortie in the most adverse weather.

Act. Wing Cdr. P. Y. DAVOUD, R.C.A.F. No. 409 (R.C.A.F.) Sqn.—This officer has been engaged in night-flying operations for more than a year. He has destroyed one and probably destroyed another enemy aircraft.

Sqn. Ldr. W. J. ALLINGTON, A.F.C., R.A.F.O., No. 25 Sqn.—This officer has completed a large number of sorties and has destroyed two enemy aircraft at night. He is an extremely able flight commander, whose efforts to achieve success in night fighting have been most praiseworthy.

Act. Sqn. Ldr. A. C. JOHNSTON, R.A.F.V.R., No. 56 Sqn. (since reported missing).—This officer has completed many sorties, including a number of low-level attacks on tugs, three of which he has sunk, barges, locomotives and other targets; in addition, he has destroyed an enemy aircraft in combat.

F/O. R. A. W. SCOTT, No. 538 Sqn.—As navigator, F/O. Scott has rendered excellent service during night-flying operations. His keenness and unflagging devotion to duty, especially in adverse weather, have set an inspiring example.

P/O. A. M. HILL, R.A.F.V.R., No. 25 Sqn.—This officer is an extremely efficient and confident night fighter. He has destroyed two enemy aircraft at night.

Sqn. Ldr. F. W. KELLY, R.C.A.F., No. 412 (R.C.A.F.) Sqn.—This officer has completed a large number of operational sorties, including a number of low-level machine-gun attacks on ground targets and several fighter bomber attacks.

Sqn. Ldr. D. G. MALLOY, R.C.A.F. No. 402 (R.C.A.F.) Sqn.—Sqn. Ldr. Malloy has participated in a large number of sorties. He is an outstanding leader, whose skill and devotion to duty have set an example worthy of high praise.

Sqn. Ldr. A. D. FERGUSON, R.A.A.F., No. 450 (R.A.A.F.) Sqn.—This officer has been in command of his squadron since May, 1942. He has personally destroyed three enemy aircraft and has led a large number of bombing raids, always pressing home his attacks with relentless determination. He has led his squadron in numerous raids, and in June, 1942, alone flew for seventy operational hours.

Sqn. Ldr. W. H. HANKIN, No. 148 Sqn.—This officer has been flying continuously on operations since the war began. One night in June, 1942, while returning from an attack on Benghazi and flying at 500ft., the port propeller of his aircraft fell off and he was forced to land in the desert. He made his way back to the squadron and, in spite of this experience, displayed great keenness to continue operations. A month later Sqn. Ldr. Hankin took command of a flight.

Major C. J. O. SWALES, S.A.A.F., No. 185 Sqn. —Since his arrival in Malta this officer has destroyed three enemy aircraft and shared in the destruction of a fourth. One day in October, 1942, he led his squadron against a large formation of enemy bombers heavily escorted by fighters. He attacked and damaged one bomber and was then driven off by enemy fighters. He returned to the combat and ultimately destroyed the bomber.

Major J. R. R. WELLS, S.A.A.F., No. 274 Sqn.—Major Wells has flown on operational duty since November, 1940. During a period of twelve days in 1942 he led ten bombing attacks with excellent results, despite the intense anti-aircraft fire encountered.

Act. Sqn. Ldr. F. A. PLINSTON, No. 55 Sqn.—During July, 1942, this officer was in command of a detached flight at an advanced landing ground, and led fifteen raids against enemy troop positions and airfields.

SERVICE AVIATION

Unescorted

Act. Sqn. Ldr. J. WALLACE, No. 223 Sqn.—Sqn. Ldr. Wallace operated throughout the campaign in East Africa and later in the Western Desert. These operations were often unescorted, and over difficult and mountainous country. Some were unescorted day raids over heavily defended areas. He is keen, courageous and efficient, and in the Western Desert has led the squadron on many successful raids.

Flt. Lt. J. H. BROWN, No. 208 Sqn.—During the last nine months Flt. Lt. Brown has flown alone on a number of hazardous missions. He has displayed coolness and courage, although he has several times been intercepted by enemy fighters. On various occasions he has been compelled to make forced landings, but with the utmost resolution has always returned to base safely.

Flt. Lt. J. H. CURRY, R.C.A.F., No. 601 Sqn.—Flt. Lt. Curry is an outstanding pilot who displays the greatest determination to engage the enemy, regardless of the opposition encountered. He has destroyed at least seven enemy aircraft, and is a source of inspiration to his fellow pilots.

Flt. Lt. J. M. MORGAN, No. 92 Sqn.—Flt. Lt. Morgan has shown great courage and considerable skill as a leader, both of a flight and of the squadron. He has personally destroyed five enemy aircraft and has materially assisted in the successes achieved by the squadron.

Act. Flt. Lt. K. L. CHARNEY, R.A.F.V.R., No. 185 Sqn.—During recent intensive fighting from Malta, this officer has led his flight with great resolution and skill. One day in October, 1942, he led an attack against a large formation of enemy bombers. The enemy formation did not reach its objective and jettisoned its bombs into the sea. He has destroyed at least three enemy aircraft and damaged several others.

Act. Flt. Lt. J. A. HETHERTON, R.N.Z.A.F., No. 37 Sqn.—Flt. Lt. Hetherton has made a large number of long-distance operational flights and has attacked targets in Cyrenaica and enemy occupied territory in Egypt.

Act. Flt. Lt. C. J. SAMOUELLE, R.A.F.V.R., No. 92 Sqn.—Flt. Lt. Samouelle is a capable and courageous leader who has materially assisted in the many successes achieved by his squadron. He has personally destroyed six enemy aircraft.

Regardless of Opposition

Act. Flt. Lt. M. WILLIAMSON, R.A.F.V.R., No. 40 Sqn.—This officer has consistently displayed great determination to complete his mission, regardless of the opposition encountered. One day in June, 1942, he was detailed to attack an enemy position, when his aircraft was attacked by a Ju 88 and received severe damage. By skilful manœuvring Flt. Lt. Williamson managed to fly the aircraft back to base. Later in September, 1942, when attacking enemy shipping at Tobruk, intense and heavy anti-aircraft fire was experienced from the shore batteries, but he pressed home his attack with considerable success.

Act. Capt. R. H. F. HOWARTH, S.A.A.F., No. 12 (S.A.A.F.) Sqn.—During his six months' service in this squadron, Capt. Howarth has participated in a large number of operational sorties. He has displayed outstanding keenness and ability both in the air and on the ground.

Act. Capt. A. JORDAN, S.A.A.F., No. 24 (S.A.A.F.) Sqn.—This officer has taken part in many operational sorties, displaying exceptional enthusiasm and determination to engage the enemy. He has proved himself to be an outstanding pilot of great courage and devotion to duty.

F/O. E. E. COATE, R.A.A.F., No. 272 Sqn.—F/O. Coate, who has been engaged in operations both in the Western Desert and from Malta, has

Air Vice-Marshal W. A. Coryton, C.B., M.V.O., D.F.C., who commands a Bomber Group, talking to some of the crews who have just returned from one of the big raids on Lorient. Air Vice-Marshal Coryton designed the practice range which bears his name.

destroyed numerous enemy aircraft both in the air and on the ground. In November, 1942, while on patrol, he shot down a B.V.222 in flames. He then severely damaged a Do 24 in spite of attacks by three fighters.

F/O. P. C. COBLEY, R.A.F.V.R., No. 272 Sqn.—This officer has been engaged in many sorties of a varied character. He has destroyed five enemy aircraft and severely damaged others. On one occasion, despite intense anti-aircraft fire, so closely did he press home his attack on an enemy ship that he narrowly avoided colliding with its mast. During a recent escort flight he attacked hostile fighters, drawing them away from our bombers and enabling the latter to return to base safely. He then engaged two enemy fighters which were attacking a Beaufighter. His own aircraft was hit in four places, and although F/O. Cobley was wounded, he succeeded in flying back to base.

F/O. C. F. CUTTING, D.F.M., R.A.F.V.R., No. 272 Sqn.—On the 10th and 12th November, 1942, this observer/navigator took part in highly successful low-level attacks against enemy airfields in Tunisia. Two days later, when attacking El Aouina airfield, his aircraft was shot down on the beach near Tunis. With great determination and after various vicissitudes, the observer and pilot succeeded in making their way through the enemy lines and joined our advanced forces.

F/O. R. T. FLEMING, R.N.Z.A.F., No. 40 Sqn. —F/O. Fleming, as captain of aircraft, has displayed courage and cool daring in many operational sorties. One night in July, 1942, he attacked enemy petrol supply dumps. Although his aircraft was held in a cone of searchlights and subjected to intense and accurate anti-aircraft fire, he made two flights over the target, during which his aircraft was badly damaged by opposing fire. Nevertheless, two days later he participated in an attack on Tobruk and continued to operate continuously, almost without rest, for six weeks.

F/O. A. E. MARTIN, R.A.A.F., No. 12 (S.A.A.F.) Sqn.—Since December 1941, this officer has participated in a large number of operational sorties. He has led the squadron on several successful raids and his work in the air has been outstanding. On the ground he has displayed great keenness in his duties, and it is largely due to his efforts that the present high standard of navigational efficiency has been reached.

F/O. G. W. PAIN, R.A.F.V.R., No. 38 Sqn.—As navigator, F/O. Pain has shown remarkable initiative and determination. On two recent occasions his skill was instrumental in locating the target, and in obtaining outstanding results.

F/O. W. M. PERKS, R.A.F.V.R., No. 223 Sqn. —This officer's skill as a wireless operator has often contributed much to the safe return of his aircraft at night in adverse weather. By his keenness and courage in the face of the enemy he has set a fine example to other wireless operators.

F/O. A. W. PIGGOTT, R.A.F.V.R., No. 38 Sqn. —Recently, during a period of a few weeks, this officer's skilful navigation so aided his captain and his crew that they were enabled to claim several thousand tons of enemy shipping sunk or severely damaged.

F/O. C. S. W. PROCTOR, R.C.A.F., No. 104 Sqn. —This officer has at all times displayed great skill as a navigator/bomb aimer. He was engaged throughout the critical period of the enemy advance and succeeded in spotting enemy concentrations in the battle area and scoring many hits on enemy transport.

Tobruk Harbour

F/O. J. S. STILLWELL, R.A.F.V.R., No. 40 Sqn. F/O. Stillwell, as navigator, has taken part in many operational sorties, mainly against enemy shipping in Tobruk harbour and on targets in the battle area. He was also a member of a crew detailed for a special mission which was achieved in a highly successful manner. On two occasions when attacking Tobruk his aircraft was held in a cone of searchlights and subjected to intense and accurate anti-aircraft fire, but each time he pressed home his attack with considerable success.

F/O. R. E. WAGSTAFF, R.A.F.V.R., No. 38 Sqn. F/O. Wagstaff was the navigator in an aircraft when it was damaged by anti-aircraft fire during an attack on an enemy convoy. All electrical devices were destroyed, and a Verey cartridge set alight in the cabin. The rear gunner was wounded. F/O. Wagstaff assisted the Captain in giving first-aid treatment. Then, without any lighting or wireless aids, he safely navigated the aircraft back to base.

Lt. A. A. BOSCH, S.A.A.F., No. 12 (S.A.A.F.) Sqn.—This officer, who is now an observer, served in the Abyssinian campaign as an air gunner. Despite some trying experiences when taking part in night operations his enthusiasm has never diminished.

Lt. W. H. CARROLL, S.A.A.F., No. 24 (S.A.A.F.) Sqn.—Lt. Carroll is an exceptionally skilled observer who has led many successful and difficult bombing raids. He has set a splendid example to all by his keenness and devotion to duty.

Lt. E. G. CATTON, S.A.A.F., No. 221 Sqn.—Lt. Catton has been engaged on many anti-submarine and anti-convoy patrols in the Mediterranean. On a recent sortie his aircraft received two hits; one damaged the hydraulics, and the other slightly wounded the navigator. Although unable to gauge the extent of the damage, Lt. Catton continued his patrol. On his return he made a skilful landing with undercarriage retracted. None of the crew was injured, and the aircraft was only slightly damaged.

The new badge to be worn by airmen of the Air/Sea Rescue Service.

Lt. T. DALLING, S.A.A.F., No. 12 (S.A.A.F.) Sqn.—This officer is an extremely capable pilot who has concluded every night bombing raid by machine gun attacks on targets in enemy camps. Lt. Dalling has shown an outstanding tenacity of purpose and enthusiasm for operations.

Lt. C. MACKEOWN, S.A.A.F., No. 24 (S.A.A.F.) Sqn.—During the last six months Lt. MacKeown has participated in a very large number of operational sorties. At the time of the withdrawal and fighting in the Alamein area his tireless energy inspired all with whom he came in contact.

Lt. H. W. MARCHANT, S.A.A.F., No. 208 Sqn.—This officer has taken part in many operational sorties, the majority being lone tactical reconnaissances. Throughout he has shown admirable initiative and skill, on several occasions being forced to fight his way home. Lt. Marchant's reports have always been accurate and detailed.

A Key Man

P/O. C. L. STEIN, R.A.F.V.R., No. 38 Sqn.—P/O Stein's skill as a wireless operator has, on many occasions, enabled his captain to overcome most difficult circumstances. In August he was wireless operator in an aircraft which attacked an enemy merchant vessel, escorted by three destroyers. In the face of the most intense enemy opposition, on this and other occasions, P/O. Stein displayed complete unconcern for his personal danger, which has been an inspiration to the rest of his crew.

P/O. F. WATSON, R.A.F.V.R., No. 148 Sqn.—This officer has attacked Tobruk many times, and has continually pressed home his missions from a low altitude. On one occasion his aircraft was hit by anti-aircraft fire, but he flew it safely back to base. P/O. Watson has also made raids on the enemy's airfields and lines of communication in the battle area.

2/Lt. G. A. P. GREINDL, S.A.A.F., No. 12 Sqn. —2/Lt. Greindl has taken part in a large number of operational sorties. He has displayed exceptional keenness and devotion to duty both by day and night, and has always volunteered for any hazardous task.

W/O. G. D. Y. POLLOCK, No. 38 Sqn.—During hostilities in France this officer displayed great determination and fortitude in continuing operations after he had been shot down, resulting in a year's hospital treatment. For the past six months W/O. Pollock has served as assistant navigation officer. One night in September, 1942, he was detailed to attack enemy shipping in the Mediterranean. His skilful navigation resulted in the location of a large enemy merchant vessel on which two torpedo hits were obtained. In the ensuing engagement W/O. Pollock was wounded in both legs, but after receiving first-aid treatment he continued with his duties.

W/O. W. D. ROSS, R.C.A.F., No. 148 Sqn.—Since February, 1942, W/O. Ross has taken part continuously in operational flying. He has participated in 14 bombing raids on Tobruk, pressing home his attacks regardless of opposition. On one occasion in September, 1942, he attacked from 10,000 ft., despite having a cripped aircraft. In addition this officer has made several successful raids on the enemy's transport in the battle area.

W/O. J. TOZER, No. 55 Sqn.—W/O. Tozer is an excellent air observer whose keenness and devotion to duty have been an inspiration to all. During the period from 1st to 22nd July, 1942, he participated in 15 operational sorties.

Oversea Reconnaissance

Act. Sqn. Ldr. J. N. STACEY, No. 205 Sqn.—This officer has completed much operational flying, involving reconnaissances over the Atlantic and Indian oceans and the Mediterranean. He is a fearless captain, whose determination to achieve success has set a most inspiring example.

Act. Sqn. Ldr. A. H. HARDING, No. 221 Sqn.—This officer has completed one hundred sorties, including operational flights both from this country and the Middle East. He has on several occasions located enemy convoys in Mediterranean waters, and by skilfully illuminating them, has enabled our torpedo-carrying aircraft to inflict loss. During a shipping reconnaissance one night in December, 1942, his aircraft developed engine trouble. Despite this, Sqn. Ldr. Harding flew it back to base, a distance of some 200 miles.

Act. Sqn. Ldr. R. C. MACKAY, R.A.A.F., No. 69 Sqn.—This officer has completed numerous sorties. He has located many enemy convoys and, on several occasions, he has been instrumental in guiding other attacking forces to the target.

Act. Flt. Lt. T. MAXWELL HUDSON, R.A.F.V.R., No. 205 Sqn.—In December, 1942, this officer captained an aircraft engaged on a low-level attack on an enemy objective. Despite heavy opposing fire, Flt. Lt. Maxwell-Hudson pressed home his attack with great vigour, but his aircraft was hit in many places by anti-aircraft fire. The aileron control was rendered useless and one of the engines was damaged. In subsequent evading tactics his aircraft struck the water, but Flt. Lt. Maxwell-Hudson retained control and escaped from the fire zone. On the return flight he flew his damaged aircraft through tropical storms, but refrained from using his wireless apparatus so that other aircraft engaged should not be endangered. He eventually reached base with only a few gallons of petrol remaining in the tanks after flying a distance of 1,000 miles.

F/O. B. E. JOHNSTON, R.C.A.F., No. 70 Sqn.—As wireless operator/air gunner, this officer has participated in numerous sorties, including bombing attacks on targets both in Germany and the Middle East. On one occasion, over Tobruk, his navigator was badly wounded by enemy fire. F/O. Johnston promptly applied a tourniquet and, by carefully tending him throughout the return flight, probably saved his comrade's life. On September 9th, 1942, the aircraft in which he was flying was hit by anti-aircraft fire and the pilot was forced to land it some 300 miles inside enemy territory. Throughout the following 29 days, F/O. Johnston displayed great leadership, and, despite hazardous experiences, eventually led his comrades to safety.

F/O. W. J. MARTIN, R.A.F.V.R., No. 69 Sqn.—This officer has taken part in many sorties involving patrols and attacks on enemy shipping in the Mediterranean. He has always displayed great courage and determination and has successfully attacked two ships.

P/O. G. W. BATES, R.A.F.V.R., No. 223 Sqn.—This officer has completed a large number of operational flights. In the Western Desert he has taken part in many daylight bombing attacks on the enemy's airfields and retreating columns. He has destroyed two Ju 52s.

P/O. R. EDMOND, R.A.F.V.R., No. 223 Sqn.—This officer has participated in very many sorties, comprising attacks on airfields, harbours, lines of communication and troops. Throughout he has displayed great courage and leadership. In November, 1942, whilst attacking the enemy his aircraft was hit and damaged by anti-aircraft fire, which caused the engine to fail. P/O. Edmond was forced to leave the formation while still some fifty miles within enemy territory. With great difficulty he succeeded in flying his damaged aircraft to base where he effected a masterly landing.

P/O. B. R. TERRY, R.A.F.V.R., No. 601 Sqn.—During the battle of Egypt this officer took part in an attack on the headquarters of a mechanised division. During the operation a fellow-pilot was compelled to force-land his aircraft in the rear of the enemy's lines, but in view of the enemy, P/O. Terry immediately flew to his assistance and, although the area was strongly defended, he landed, picked up his comrade, and took off safely.

DISTINGUISHED FLYING MEDAL

Flt. Sgt. J. W. KING, No. 144 Sqn.—In December, 1942, this airman captained one of a small formation of aircraft which attacked two merchant vessels and an armed ship off the Norwegian coast. In the face of heavy opposing fire, Flt. Sgt. King pressed home his attack and obtained a hit on one of the merchant ships. It was subsequently learned that the vessel was destroyed.

Sgt. E. E. WERTZLER, R.C.A.F., No. 460 (R.A.A.F.) Sqn.—One night in January, 1943, this airman was the air bomber of an aircraft which attacked the Ruhr. Shortly after leaving the target area, the aircraft was attacked by an enemy fighter. Sgt. Wertzler was wounded in the right leg, but he resolutely manned his guns, although his turret became unserviceable, until the attacker was eventually shaken off. Meanwhile, a fire had broken out in the bomb bay, but Sgt. Wertzler put out the flames with extinguishers despite a painful injury to his eye, caused by one of the extinguishers exploding.

Flt. Sgt. G. D. W. BAXTER, S.A.A.F., No. 12 (S.A.A.F.) Sqn.—Since December, 1941, Flt. Sgt Baxter has flown on many operational sorties, including coast reconnaissances and operations in the Middle East. His work as a gunner has been outstanding, and despite many trying experiences his enthusiasm has never wavered. He has destroyed one enemy fighter.

Flt. Sgt. W. O. DAYNES, No. 223 Sqn.—As wireless operator Flt. Sgt. Daynes has taken part in many operational sorties in the East African campaign and the Western Desert.

Flt. Sgt. R. C. FROST, No. 55 Sqn.—This wireless operator/air gunner, during the first 22 days of July, 1942, made fifteen sorties against the enemy's troop positions and landing grounds.

Flt. Sgt. A. HARRISON, No. 223 Sqn.—Flt. Sgt. Harrison has on many occasions acted as leading observer for the squadron, and has achieved great success against difficult targets in the desert.

Flt. Sgt. E. L. MAHAR, R.A.A.F., No. 185 Sqn. —This airman has led his section into action on many occasions. On the 14th October, 1942, he led an attack on a large force of enemy bombers and fighters, and after his flight had been broken up Flt. Sgt. Mahar destroyed one Ju 88 by a stern attack. He is a determined and courageous

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pilot who has destroyed at least three enemy aircraft.

Flt. Sgt. J. NICKELL, No. 24 (S.A.A.F.) Sqn.—Flt. Sgt. Nickell has taken part in a large number of operational sorties. In addition he was a member of the crew flying with General Ritchie, over the forward line

Flt. Sgt. B. H WILLSON, No. 223 Sqn.—This air gunner has taken part in many operational sorties in the Western Desert, of which at least ten were in daylight and unescorted. His calm and clear directions when confronting the enemy have been of great assistance to his captain.

Air Sgt. W. R. ANDERSON, S.A.A.F., No. 24 (S.A.A.F.) Sqn.—Throughout his many operational sorties, Air Sgt. Anderson has proved himself to be an excellent air gunner. The conscientious manner in which he has applied himself to his task is worthy of the highest praise.

Repairs in the Air

Sgt. A. L. BRADBURY, No. 37 Sqn.—Sgt. Bradbury has taken part in a large number of long-distance operational flights, including attacks on targets in Cyrenaica, Tripolitania, Crete and enemy-occupied territory in Egypt. Throughout he has shown himself to be a most conscientious and reliable wireless operator. When the aircraft in which he was flying from the United Kingdom to the Middle East was on the last stage of its journey, the wireless apparatus became unserviceable. Sgt. Bradbury effected repairs in the air, and with great initiative made arrangements for the aircraft's reception, arrival at the base taking place with only enough petrol for a further ten minutes' flying.

Flt. Sgt. R. A. BILLEN, No. 70 Sqn.—Flt. Sgt. Billen has taken part in many night bombing raids against the enemy in North Africa and the Mediterranean. On two occasions he has been detailed to illuminate the target, and on each occasion, despite severe opposition, his skill has largely contributed to the success achieved.

Sgt. M. J. T. CANE, No. 148 Sqn.—Sgt. Cane has participated in many operational sorties, displaying unshakeable determination in his attacks, often in the face of severe opposition. He has taken part in 17 operations against Tobruk, and on one occasion he dived to 3,500ft. in an attack against the jetties. During the enemy advance in June and July he made numerous attacks on transport and troops.

Sgt. N. C. JONES, No 38 Sqn.—One night in September, 1942, Sgt. Jones was captain of an aircraft detailed to attack enemy shipping near Tobruk. The ship was hit and caught fire. Later its destruction was confirmed.

Sgt. F. C. JORDAN, No. 104 Sqn.—Sgt. Jordan has taken part in a large number of operational sorties as wireless operator. On two occasions by his technical skill he has been instrumental in securing the safe return of his aircraft, despite serious engine trouble.

Sgt. C. G. KLIMCKE, No. 148 Sqn.—Since the 2nd May, 1942, Sgt. Klimcke has flown on a large number of operational sorties. On 4th May, 1942, when flying at 4,000ft., he hit an enemy ammunition dump in the battle area. This airman has bombed Tobruk on 18 occasions, starting many large fires. On the 6th September, 1942, although his aircraft was held by a cone of searchlights, he dived to within 5,000ft. and pressed home his attack.

Sgt. D. R. MOON, No. 148 Sqn.—One day in August, 1942, during an operation against Tobruk, Sgt. Moon sighted five enemy ships, which he immediately attacked. Later fire and smoke were seen coming from one large ship. On three other occasions this airman has made determined attacks on the jetties and shipping in Tobruk harbour. On later sorties he silenced an anti-aircraft gun in the battle area, and machine gunned the enemy's transport from a very low level.

Sgt. E. J. ROSS, R.A.A.F., No. 104 Sqn.—Sgt. Ross, as rear gunner, has displayed cool courage and absolute lack of fear in the face of intense enemy fire, and has always given his captain a clear running commentary, which has helped in evading the anti aircraft fire.

Long-distance Flights

Sgt. J. G. SOUTHWELL, R.A.A.F., No. 37 Sqn.—Sgt. Southwell has taken part in many long-distance operational flights involving operations against targets in Cyrenaica, Crete, Greece and enemy-occupied territory in Egypt. Throughout his operational career he has maintained an exceedingly high standard of efficiency, both as bomb aimer and navigator, and has always shown the utmost coolness and determination in pressing home his attack, in the face of intense opposition from the enemy.

Sgt. S. A. STAID, R.A.A.F., No. 104 Sqn.—Sgt. Staid as wireless operator has taken part in many operational sorties He has always displayed great technical ability. On at least two occasions the safe return of his aircraft has been almost entirely due to his high degree of wireless efficiency despite most adverse weather conditions.

Sgt. O. C. SWEETMAN No. 104 Sqn.—During the intensive operations at the time of our withdrawal Sgt. Sweetman displayed outstanding skill and determination in engaging the enemy in the battle area and bombing their lines of communication and tank concentrations.

Inspecting a dinghy which has been used in the rescue of a bomber crew. A thorough examination is always carried out to see if all the appliances functioned properly.

Sgt. H. TRICKS, No. 148 Sqn.—Sgt. Tricks has taken part in many operational sorties, including 20 attacks on Tobruk, where on a number of occasions he has started fires in the dockside area. He has flown many times on operations against enemy units in the battle area, setting fire to an ammunition dump and attacking the enemy's lines of communication from a low level. Throughout, this airman has continued to show the utmost keenness for operational flying despite a harassing experience when his aircraft crashed in the dark behind the enemy's lines.

Flt. Sgt. T. R. STRAKER, No. 205 Sqn.—One night in December, 1942, this airman was the flight engineer of an aircraft engaged on an operational flight. Whilst over the target area the aircraft was hit by anti-aircraft fire, which caused one engine to fail and the wing tip float to drop. While his pilot was making great efforts to regain control, Flt. Sgt. Straker, realising the great danger of the aircraft crashing in the sea, if the damaged float struck the water, succeeded in restoring the float to its position. By his promptitude he contributed materially to the safe return of the aircraft.

Flt. Sgt. G. E. CORNES, No. 223 Sqn.—Since May, 1942, Flt. Sgt. Cornes has taken part in a large number of operational sorties against enemy targets in the Western Desert. A considerable number of these flights were made without fighter escort and in many instances interception by hostile fighters occurred In October, 1942, this airman flew one of a formation of aircraft detailed to attack an enemy landing ground near Daba. Flt. Sgt. Cornes's aircraft was hit by anti-aircraft fire and the starboard engine rendered useless. He was forced to leave the formation and, escorted by a small number of fighters, eventually landed his badly damaged aircraft safely at base.

Flt. Sgt. A. W. FARQUHARSON, No. 46 Sqn.—In December, 1942, Flt. Sgt. Farquharson was the observer in one of a formation of aircraft detailed to make a low level attack on enemy shipping off the coast of Tripoli. Following the operation an attack was made by enemy fighters and Flt. Sgt. Farquharson received a wound in the shoulder. A running fight continued for twenty minutes. The cool, explicit instructions for evasive action given by this airman enabled him to damage and probably destroy one of the attackers and at the same time greatly assisted his pilot in flying the aircraft safely back to base.

Sgt. M W. BISHOP, No. 40 Sqn.—This airman has participated in many successful attacks on enemy shipping and on the installations at Tobruk, at a time when the area was very heavily defended. After being posted to Malta, he volunteered for further operational duty and took part in a number of sorties against Bizerta, Tunis and targets in Sardinia.

Sgt. J. V. PRICE, No. 233 Sqn.—In September, 1942, this pilot participated in an attack on enemy troops and motor transport. His aircraft was subjected to heavy and accurate anti-aircraft fire and sustained severe damage. Sgt. Price was wounded in the head by a shell splinter. Though dazed, and suffering from concussion, he proceeded with his mission and flew the aircraft safely back to base. After a short period in hospital, Sgt. Price returned to his operational duties. This airman has participated in numerous bombing raids, many of them unescorted attacks information on enemy airfields, installations and harbours.

Sgt. J. W. STRAIN, No. 70 Sqn.—During the final battle at El Alamein, this airman participated with success in daring low level operations against enemy motor transport. In August, 1942, while endeavouring to secure a photograph, after bombing, his aircraft sustained severe damage from intense anti-aircraft fire, which blew off the front hatch. Sgt Strain, bleeding dangerously from a wound in the arm, was pulled to safety by the 2nd pilot. The bleeding was stopped by the application of a tourniquet and, in spite of this hazardous experience Sgt. Strain was again on operational duty after a very short interval. As navigator/bomb aimer he achieved outstanding results during numerous sorties over Tobruk, where many large fires were started despite heavy opposition.

THE KING has been graciously pleased to approve the following awards:—

B.E.M. (MIL.)

A/C.1 J. H. MCNEILL.—One night in June, 1942, during an enemy attack a bomb demolished a block of shops and houses, and fire broke out owing to escaping gas. The flat asphalt roof was practically intact, lying across the wreckage, and cries for help were coming from underneath. A/C. McNeill was among the first to appear on the scene, and, joining a volunteer rescue party, burrowed his way underneath the debris. After 3½ hours' work they succeeded in rescuing a number of persons, despite the constant danger from fire and falling debris and the risk of the roof collapsing completely.

A/C.2 F. BROWN.

A/C.2 C. T. WELSH.—H.M. Minesweeper *Changteh* sailed from Singapore in February, 1942, carrying 40 officers and men of the R.A.F., among other passengers, and was sunk the next day by air attack, with heavy loss of life. Forty men escaped in the only undamaged boat, the proper complement of which was 22. After being nearly swamped in heavy weather, they reached land near the mouth of a river a few days later, but found no fresh water. Thirty survivors were picked up next day. The naval officer-in charge of the party has reported that the two airmen mentioned above were outstanding. They never faltered throughout a severe ordeal and set a magnificent example to all the rest.

A/C.2 D. A. WELLESLEY (Viscount Dangan).—In August, 1942, a refueller was being started up by two members of its crew, when there was a terrific explosion and it burst into flames. There were four refuellers moored in pairs, bow to stern. One member of the crew was blown into the water and the other was killed. A/C.2 Wellesley rushed to the refuelling pier, dived into the water in which there are tarracuda and alligators, swam to the two refuellers that were not alight and immediately began to cast off. He had nearly completed his task when reinforcements arrived. They were inspired by his example and the two refuellers were got away safely from the conflagration.